MODERN AMERICAN RAILWAY PRACTICE

A Complete System
of
PRACTICAL
INSTRUCTION
in RAILWAY TRANSPORTATION

Ten Volumes
Profusely Illustrated

Calvin F. Swingle
EDITOR IN CHIEF

ASSISTED BY A CORPS OF
MECHANICAL EXPERTS

PUBLISHERS
NATIONAL INSTITUTE of PRACTICAL MECHANICS
CHICAGO · ILLINOIS

TFT
.S9
v.5

08-33937

11 707

STATION WORK AND TELEGRAPHY

A Treatise on the Duties of Stationmen and Telegraphers, together with a Complete List of Blank Forms Used in Station and Train Work.

VOL. V

ILLUSTRATED

BY

CALVIN F. SWINGLE, M. E.

AND A CORPS OF PRACTICAL MECHANICAL EXPERTS

PUBLISHERS

NATIONAL INSTITUTE OF PRACTICAL MECHANICS

CHICAGO, ILL.

LIBRARY of CONGRESS
Two Copies Received
NOV 16 1908
Copyright Entry
Aug. 24, 1908
CLASS a XXc. No.
216973
COPY B.

COPYRIGHT 1908
BY THE
NATIONAL INSTITUTE OF PRACTICAL MECHANICS
CHICAGO, ILLINOIS

ALLIED PRINTING TRADES COUNCIL 42

EDITOR-IN-CHIEF

CALVIN F. SWINGLE, M. E.

ASSOCIATE EDITORS

SIDNEY AYLMER-SMALL, M. E.

HENRY C. HORSTMAN

VICTOR H. TOUSLEY

W. G. WALLACE

L. ELLIOTT BROOKES, M. E.

FRANK H. DUKESMITH, M. E.

PARTIAL LIST
OF
AUTHORITIES CONSULTED

Wm. Kent, C. E.
Author of "Mechanical Engineers' Pocket Book."

R. Grimshaw, M. E.
Author of "Locomotive Catechism."

Joshua Rose, M. E.
Author of "Modern Machine Shop Practice."

Fred Colvin, M. E.
Author of "Compound Locomotives," Etc.

D. B. Dixon.
Author of Works on Valve Setting, Etc.

Brotherhood of Locomotive Firemen's Magazine,
"Breakdown Questions and Answers."

The Air Brake Association,
Authority on Air Brake Questions.

Prof. E. R. Dewsnup.
Author of "Railway Organization and Working."

PARTIAL LIST OF AUTHORITIES CONSULTED

FREDERICK L. MEYER.
Author of "Railway Station Work."

C. E. COLLINGWOOD.
Author of "Questions and Answers on Train Rules."

F. W. HALLETT,
Author of "Treatise on Telegraphy."

HOULIHAN'S HANDBOOK.
For Railway Employees.

AMERICAN RAILWAY ASSOCIATION.
"Standard Code of Train Rules," "Rulings on Questions Submitted," "Block Signal Rules," Etc., Etc.

F. J. COLE, M. E.
Author of "Four Cylinder Balanced Compound Locomotives."

WM. FORSYTH AND J. C. MUHLFELD,
Authors of "Walchaert Valve Gear," "Railroad Men," "Duties of Employees," Etc.

CLARK CARYL HASKINS,
Author of "Electricity Made Simple."

ROBERT THURSTON, M. E.
Author of "History of Steam Engine."

PARTIAL LIST OF AUTHORITIES CONSULTED

WILLIAM RIPPER,
Author of Work on "Steam."

CHAS. H. HASWELL, M. E.
Author of "Engineer's Pocket Book."

C. W. MCCORD, A. M.
Author of "Movement of Slide Valves."

S. P. THOMPSON, B. A.
Author of "Dynamo—Electrical Machinery."

J. C. TRAUTWINE, C. E.
Author of "Civil Engineer's Pocket Book."

ANGUS SINCLAIR, M. E.
Author of Twentieth Century Locomotive.

WM. STROMBERG, M. E.
Author of Steam Boiler.

CHAS. MCSHANE, M. E.
Author of Locomotives Up-to-date.

EMORY EDWARDS, M. E.
Author of Modern American Locomotive Engines.

Sam'l F. B. Morse.

INTRODUCTION.

Modern American railway practice more than any other industry, demands skill in financiering; skill in management and superintendence; skill and energy in the operation of trains, and a degree of intelligence and specialized technical knowledge which is year by year becoming more and more exacting in its demands and requirements.

If devotion to the interests of one's employers and the application of cumulative knowledge acquired through long years of practical experience, study and observation, is demanded of any people in the world it is demanded of railway employes.

Although the requirements are most exacting, the labor arduous and the attendant tension severe, yet there is a fascination and exhilaration derived from the service. The excitements of the road, the constant desire to accomplish results, the strife for business, and the knowledge of being, in a sense, in the public eye, combine to stimulate all to do their best and to a large extent the discomforts and disadvantages are thus compensated for.

Railroading is a profession, as high in degree as any other profession, and calling for abilities and talents as great as those called for in any other; and like other professions of modern times, those who get an understanding of the general fundamental principles of railroading as a whole, and who then specialize upon some particular department, are the men who will in the future be in greatest demand, command the best and most responsible positions and will be best equipped to climb into the positions higher up.

For their own interests railroaders should study as well as labor. Get knowledge of railroading as a whole, and then specialize on some particular department, and thus by combining experience and knowledge—practice and theory—they will be better able to qualify for official positions in the great railway army.

Employes in the transportation department, in which is included railway stations—both passenger and freight—come into close contact with the public. The duties which devolve upon them are varied. The responsibilities great. They are often confronted with conditions rather than theories. To meet new conditions promptly and without friction with the public necessitates not only a knowledge of their own duties, but likewise a general knowledge of all things which are likely in any way to affect the conduct of the business of the railway with the general public. This is the kind of knowledge which counts for something, and which is indispensable to those who are likely to be suddenly called upon to take the initiative when some sudden emergency arises.

The range of subjects which come within the scope of this volume should prove of interest and value not alone to the beginner in railway station service, but also to those who seek to supplement the knowledge they have acquired through actual experience, with the ideas and suggestions of those who, either through long experience, or close research and study, are qualified to write upon the various subjects.

The subject matter upon the different topics covered has been collated from a number of authoritative sources, and the writer of the portion on telegraphy—Mr. F. W. Hallett—has himself shared the anxious cares of other telegraphers who in their daily labors have known its perplexing cares.

THE ORGANIZATION OF RAILWAYS

THE ORGANIZATION OF RAILWAYS.

Railroads have been the pioneers of civilization and commerce in America. They have blazed a way through forests, climbed mountains and pierced them, spanned rivers, built and established highways through the arid plains and desert regions. They have been the feelers through which human society has reached out and extended its domain over untrammeled nature. Mr. James J. Hill is authority for the statement that "In no uncertain way have the railroads enabled us to make our country what it is to-day. They are pushing its prosperity and leading its progress as can no other single force."

In the wonderful development of railways the rank and file has been a potent factor. Employes have exhibited courage, heroism and loyalty. They have worked hard and long and have done much to make the theories of yesterday the practices of to-day.

They have fully demonstrated that "There is no royal road to success," and the truth applies to all walks of life. In the political world and occasionally in business life, favoritism and "pull" are dominant factors; but in a larger sense there is no short cut to success, and nothing can take the place of hard work. This is especially true in railroading, and accounts for the fact that in no other line of business is there found such a high order of ability as that shown among the officials in transportation circles. In fact the majority of the executive and operative officials to-day began their railroad career in some lowly position, and by hard work, constant applica-

tion and an unwavering determination they advanced from one position to another.

The great railroad men of the country have come up from the ranks. Here and there may be found one who entered the business with a university education, but a large majority made their start with a common school education, in some instances supplemented by a technical or academic course. There is hardly a minor position connected with the railroad business from which one or more men have not climbed to the top or near the top. While favoritism may be in evidence occasionally, it is seldom that a favorite without capacity gets ahead of a man of real ability.

A knowledge of the whole enables one to handle a part more intelligently. No matter what work an employe is engaged in, it is important for him to know the whole plan of the business. Many are content to know merely their own part of the work, and never give a thought to what is going on in other departments. This necessarily limits their range of view, and makes them in some degree less valuable. It is this very attitude that often keeps men doing one thing all their lives.

The right spirit is that shown by the man who wants to know all he can about all parts of the business as well as all about his own work. To have some conception of the business as a whole enables a man to work in harmony with the purposes of his employer, and to carry out the spirit as well as the letter of his instructions. This must eventually tell in the quality of the man's work, and so affect his standing and progress. To understand the necessity for an action adds an impetus which nothing else can give, and impetus is thought and purpose.

System is order instead of chaos. It is the organized

army instead of the mob. It is calmness instead of confusion. The systematic man works according to method instead of in a haphazard way. He proceeds logically instead of helter-skelter, because he knows the what, the why, the where and the when, of every phase of his business. He can locate a trouble quickly, and remedy it effectively.

It is much easier, of course, to work along in a beaten path than to strike out into new paths. The tendency is always to be satisfied with what is already known. But that is not enough. One must reach out beyond his own personal experience and profit by the experience of others. The best part of an education is that which one gives himself, but one cannot hope to know even the fundamental principles of a science thoroughly without reading on the subject. But one must first grasp and clearly understand fundamental facts before attempting to make practical applications. The successful operation of a railway depends to a large extent upon its being methodically organized with its graded officers and its rank and file. Each in his appointed place and each carrying out his particular part of the work with precision and promptness. This in turn necessitates system and intelligent action. Those whose knowledge and understanding of the general organization of a railway and the functions of each department, of the interdependence of each, and the reasons for rules and regulations, can not only work in perfect harmony but are better qualified to act with decision and foresight when some unforeseen emergency makes it necessary for some one to promptly take the initiative.

Therefore the importance of a familiarity with the general organization of a railway is at once apparent. Prob-

ably the subject cannot be better treated than it has been done by an eminent authority, who through many years of active experience and intimate knowledge of the subject is qualified to do so. Concerning railway organization he states:*

"The purpose of a railroad may briefly be stated to be the safe and expeditious transportation or conveyance of persons and things from one place to another, all other considerations being subordinate or incidental to that purpose. To produce this result in a definite, systematic, reliable and economical manner, is the object of railway organization and the aim of the service. Notwithstanding the apparent simplicity of the purpose, the means required for its development are ponderous to a degree beyond that of any other industry, and the methods of administration are of a most complex order.

"The ownership of a railroad is vested in the shareholders, who control the property through a Board of Directors, which they elect for the purpose of administration. The Board of Directors in turn elects the President, who as chief executive officer guides the administration and exercises all the powers of control and direction. To assist him in this responsible task, heads of departments are appointed, who have control of the active management. From this point the organization differentiates rapidly, the duties of the officers of the various ranks becoming less general in their scope, and the extent of their territory correspondingly diminished, until finally their locations are fixed and their duties confined specifically to details, the capable handling of which contributes so greatly to the success and efficiency of the management.

*Mr. A. W. Sullivan, "Lectures on Commerce."

"The principal departments of railway service are usually classed as follows: Law Department, Treasury Department, Traffic Department, Operating Department. The President as chief executive officer has authority in all departments. Upon large systems of railway the head of each of the principal departments named is usually a Vice-President, with jurisdiction limited to his own department. Each Vice-President is assisted by a corps of officials, in whom are vested the control and supervision of the varied affairs of the department.

"The functions of the different departments are indicated in a general way by their names. The Law Department gives opinions on all matters upon which legal advice is required; draws mortgages, leases, bonds, contracts, or other papers; and has charge and control of all litigation in which the railroad is interested. The Treasury Department has charge of all funds and securities, the books, accounts, and records, and of the receipts and disbursements. The Traffic Department has charge of the passenger and freight traffic, the tariffs, the interchange of business with other railroads, and the commercial relations with the public. The Operating Department has charge of construction and the maintenance of the railroad, its equipment, the trains and stations, and of the personnel and discipline of the service."

He treats mainly of the operating division, and specifically of the transportation department of the service, and continuing, he says:

"Under the head of what is generally known as 'operation' is included the administration of all the physical resources and activities of the property; and to accomplish this end most effectually the operating service is subdivided into the following departments: Road De-

partment, Machinery Department, Transportation Department. The heads of the different operating departments report direct to the General Manager, who in turn reports to one of the Vice-Presidents. As there is, however, no fixed standard of organization upon the railways of this country, there are frequent variations from the general type here presented, made necessary by local conditions and circumstances, so that it is not unusual to find officers of similar titles performing different duties upon different railways.

"The completeness of an organization depends in large measure upon the extent of territory over which the general officers have jurisdiction, and the density of the traffic. Roads of small mileage and heavy traffic will require as extensive an organization as a road of large mileage upon which the traffic is of moderate volume. The highest differentiation will be found upon those railroads which combine extensive mileage with heavy traffic of a varied character.

"The general officers are those whose jurisdiction extends in one or more departments over the entire line of the road.

"The Road Department is usually in charge of the Chief Engineer, who reports to and receives instructions from the General Manager. The function of the department is to construct and maintain the roadbed and track; the bridges, trestles, and culverts; the station grounds and roadways, station buildings and platforms; warehouses, elevators, docks, and wharves; the shop buildings and engine-houses; the water-supply, pumping stations and tanks; the coal-chutes and storage bins for fuel; the turntables, cinder-pits, and the accessories necessary to make complete the fixed ele-

ments of the physical organization of the railroad. In the administration of his department the Chief Engineer must determine the standards of size, weight, form, and capacity required of all classes of track material, the design of bridges, the plan and construction of buildings, the arrangement of yards for the reception and departure of trains, the switching and storage of cars, the installation of interlocking and block signals, and the combining and arrangement of facilities at terminals of divisions and of the line, so that the free circulation may be assured.

"In this work he is assisted by a staff, adjusted to the extent of territory under his jurisdiction and organized usually along the following lines: One or more assistants with the drafting and clerical force, which administers the main office and constitutes his personal staff. This staff, subject to his personal supervision, makes reconnoisances, preliminary and final surveys of new lines, prepared specifications and estimates of cost, and has charge of all new work under construction. It also assists in the design of the standards established for the use of the department, and in the planning of yards and terminals, and has charge of the general records and statistics of the department. This staff consists of the following: an Engineer of Bridges and Buildings, who prepares the plans and specifications of the new structures and has charge of their construction and renewal; a Signal Engineer, who has charge of the installation and renewals of the appliances used for block signals and interlocking; an Engineer of Maintenance of Way, who is in immediate charge of the work of maintaining the property to the required standard of efficiency, and who has general charge of the extensive force of men needed

to make the necessary repairs to the roadway, track, bridges, trestles, culverts, buildings, waterworks, scales, and other structures, and of the working stock of material and supplies required for these purposes. To assist the Engineer of Maintenance of Way in the general discharge of his duties, there are assigned to his staff a Superintendent of Bridges, a Superintendent of Waterworks, and a Master Carpenter, who have jurisdiction, each in his own line of work, over the entire road.

"The Machinery Department is in charge of the Superintendent of Machinery, or, as frequently designated, the Superintendent of Motive Power, who reports to and receives instructions from the General Manager. The function of the department is to prepare plans and specifications for the construction of locomotives and cars of all the different classes that are required in the service of the road; to establish standards that will secure uniformity and interchangeability of parts; to equip and operate the shops for repairs of locomotives and cars, and to maintain the working stock of material and supplies needed for the purpose; to inspect the locomotives and cars that are in service, and keep them in safe and efficient condition, withdrawing from service such as are found to be in need of repairs; to inspect, in accordance with established rules, the cars received from connecting railways in the interchange of traffic, and to make adjustment of claims arising from damage and loss of cars so used; to employ the mechanics required in the various metal and wood-working trades of the different shops, and the inspectors and laborers needed in other classes of the work; also, upon many roads, to employ the locomotive enginemen and firemen. The selection of capable men for the highly skilled work of this depart-

ment, and the maintenance of discipline therein, are duties requiring experience and judgment.

"The Superintendent of Machinery upon large roads is aided in the management of his department by two assistants, one of whom usually is given jurisdiction in the locomotive department and the other in the car department. He also has on his personal staff a Mechanical Engineer, who is usually directly in charge of the drafting office, and is immediately concerned with the mechanical standards and devices used in the department. Where a special testing bureau does not exist, the Mechanical Engineer is frequently charged with the duty of conducting tests of materials and of the efficiency of locomotives.

"The Transportation Department is in charge of the General Superintendent, who reports to and receives instructions from the General Manager. The function of this department is to conduct the transportation of passengers and freight in a safe, economical, and efficient manner; to assign the motive power so that it may be used to the best advantage; to distribute the cars for loading, and to move them promptly so that they may be made to perform the fullest possible service; to keep a record of the movements of cars, and to make settlements with other railroads for the use of cars interchanged; to provide adequate station service so that proper accommodation will be afforded for the reception of passengers, the sale of tickets, and the checking of baggage; to provide for the reception and loading of freight, the preparation of way-bills to accompany the freight in its movement over the road, and the necessary arrangements at its destination to deliver the freight to the consignees, and to collect the

charges for the service performed; to prepare time-tables, and provide rules for the safe and efficient movement of trains; to organize the personnel of the train and station service so that employes may be assigned with a proper regard for their skill and capacity to perform the duties required of them; to provide and distribute the fuel and supplies required for engines, trains, and stations; to provide adequate telegraph and telephone service; to care for injured passengers and employes, and to adjust claims arising from loss and damage to property; to guard and protect the property belonging to or intrusted to the care of the road; to exercise supervision over employes in the service, and see that proper discipline is maintained. The efficient administration of the Transportation Department comprehends the utilization of the fixed physical elements supplied by the Road Department, and of the movable physical elements furnished by the Machinery Department, by a highly trained organization of men skilled in the work of conducting train movements under all the varying conditions of weather, daylight, and darkness, to the end of developing with certainty of result the safe and expeditious conveyance of persons and things from one place to another.

"To assist the General Superintendent in this work, he is provided with a staff, consisting usually of one or more Assistant General Superintendents, who exercise all the powers of the General Superintendents necessary for the proper management of the several parts of the road which are under their respective jurisdictions; a Superintendent of Transportation, who has general charge of the distribution of the car equipment, its movement, and the records relating thereto; a Super-

intendent of Telegraph, who has charge of the management and maintenance of the telegraph and telephone lines and service, and of the distribution of standard time; a Chief Surgeon, in charge of the Surgical Department, which consists of Division Surgeons, with jurisdiction over divisions of the road, and Local Surgeons at the more important stations, in charge also of the Hospital Service, for the care of the injured, and of the examination of applications for employment, to determine their visual power, color perception, and sense of hearing, and their general physical condition with reference to their fitness for the service; a Chief Claim Agent, who with a staff of assistants has charge of the settlement of claims for loss by fire, damage to property and live stock, and the adjustment of claims resulting from personal injuries; a Chief of Police, who has charge of the watchmen, and a corps of special agents to investigate pecuniary irregularities of the service, and to protect the passenger service and the property in charge of the road from the depredations of criminals.

"The General Manager, as the head of the operating service, must co-ordinate the work of his several departments so as to develop harmony of action and unity of purpose. He must be in close touch with the Traffic Department, and adjust the schedules of the passenger and freight trains to meet the competitive and commercial conditions existing in his territory so as to serve conveniently and efficiently the local needs as well as the requirements of through traffic. He must see that an adequate stock of materials and supplies is provided for maintenance and operating purposes, and that the work of the several departments is so adjusted in the course of each year that the highest condition of efficiency will

be developed at the time that the demand exists for the heaviest service. He must control and regulate the expenses to conform to the revenues, and so judiciously direct the expenditures for improvements that immediate as well as permanent benefits may be realized. He must see that the working rules and regulations are strictly enforced, that the agreements as to way schedules are rigidly adhered to, and, when differences of interpretation arise between the officers and the men, that the questions referred to him as arbiter are determined with judicial fairness and equity. He must maintain, along with strictness of discipline, such a recognition on the part of the working organization of his justness of purpose that confidence and harmony will prevail throughout the service —conditions essential to the highest degree of efficiency.

"When a railroad exceeds three hundred miles in length, it is usually separated into divisions, and in each department those officers whose jurisdiction is limited to a division are known as division officers. The length of a division is seldom less than one hundred miles, even in thickly populated sections of the country; while upon railroads traversing thinly settled districts, with light traffic, a division may include from five hundred to seven hundred miles of road. The division offices are usually located either at the most central or at the most important point on each division.

"The most approved form of organization places the Superintendent at the head of the division forces and invests him with full authority in the Transportation, Machinery, and Road Department affairs of his division. The authority of the general officers of each department becomes focused in the Superintendent, and as their direct representative he exercises within the limits

of his jurisdiction the executive functions of the head of each department. In respect to this concentration of authority the Superintendent becomes virtually the General Manager of his division, and his responsibilities correspond to the scope of his authority. This system gives great compactness to the division organization, and the large authority of the Superintendent, when well directed, is productive of high efficiency.

"To assist him in this work he has a staff composed of a Train Master, in charge of the Transportation service; a Master Mechanic, in charge of the Machinery Department service; and a Road Master, in charge of the affairs of the Road Department. The division officials are in immediate charge of the extensive working forces employed in the maintenance of the roadbed, tracks, fixed signals, bridges, buildings and other structures; the locomotives, cars, shops, and engine houses; and the operation of the train and station service. The standards of maintenance, the train schedules, and the rules and regulations being established, it is their duty to see that the work is carried on along lines which the management adopts as the policy of the road. It is not their concern whether the policy be a wise or unwise one, nor are they held responsible for results, except in so far as the results are dependent upon the faithful and efficient performance of their duties. No other phase of the service presents such condition of incessant activity as comes within the sphere of the division officers. Their ordinary work by day and night, and in addition their emergency work whenever the necessity for it arises, demand on their part vigorous health, untiring industry, disregard of personal comfort, capacity to withstand fatigue, rapidity of recuperation, habits of sobriety, and a

zealous ambition to overcome the obstacles and difficulties which they frequently encounter.

"The Road Master must maintain the roadbed, track, bridges, trestles, and culverts in safe condition at all times for the movement of trains. Storm, flood, and fire only add to this obligation, and in such stress he must exercise the greater diligence that the movement of traffic may not be interrupted. The forces under his control consist of the mechanics and laborers employed in the erection and repair of bridges and buildings, the maintenance of pumping stations for the water-supply, the repairs and renewals required for the maintenance of roadbed and tracks, the scales used for weighing cars and the apparatus used for interlocking and block signals. He is assisted in this work by Supervisors of Track, of Bridges and Buildings, of Waterworks, of Scales, and of Signals.

"The Master Mechanic must not only maintain the general condition and efficiency of the locomotives, but in the season of heavy traffic—usually coincident with the severest weather—he must receive the engines as they come off the road, frequently in more or less disabled condition, have them cleaned, inspected, repaired, furnished with fuel and water, and made ready for service in the shortest possible time. The cars likewise require inspection and repairs, which must be made, if possible, without withdrawing them from service; and when that is unavoidable, they must be returned to service with the least possible delay. He is assisted by a General Foreman, with supervision over the different departments of the shops, in which there are other foremen immediately in charge of the machinists, the blacksmiths, the boiler-makers, the carpenters, the tinners,

the painters, and the car repairers; a Foreman of Engine House, in direct charge of the inspection and running repairs of engines, their preparation for road service, the forces employed in this work, and of the enginemen and firemen who make up the engine crew; and a Storekeeper, in charge of the materials and supplies used in the shops and by the locomotives when on the road.

"The Train Master must see that the trains are made up and run in accordance with the established schedules. When any interruption occurs, he must proceed at once to the place and arrange for the resumption of service, and when serious detentions are likely to result, he must arrange to detour the important trains and pass around the place where the obstruction exists with the least delay, using the most available foreign lines of railway for the purpose. He has jurisdiction over the yards and stations, as well as the line of road embraced in his district or division. He must see that freight cars are properly distributed, and that they are promptly loaded or unloaded, and forwarded. He has direct charge of all the engine crews and train crews, and must know that they understand the rules and are otherwise qualified to perform their duties. He must give especial attention to the weight or tonnage of freight trains, and know that locomotives are loaded to their full capacity. He is responsible for the proper and safe movement of trains, and must see that all the rules, and the special instructions of the timetable, are strictly observed. He must give his whole time and attention to the service; his office is one which is never closed, his work never completed; days, nights, and Sundays are alike; the ceaseless movement of trains knows no ending. He is assisted by a Chief Train Dispatcher, in direct charge of train

movements, the distribution of cars, the telegraph lines and operators, and the office records and statistics; and by a Yard Master at each place where there are yards in which trains are received and made up and where cars are switched and stored.

"For purposes of train service, a division, when two hundred miles or more in length, is divided into districts, which are usually adjusted to the length of a freight run, approximately one hundred miles. Freight train and engine crews are changed at the end of each district, passenger train crews run over two or more districts, while passenger engine crews generally change on each district. Engines are changed at the end of each district, although it is not unusual in passenger service and upon fast freight trains which have little or no way work to do, for the engines to run through over two districts, changing crews at district terminals. At each district terminal there is a yard for trains, with an engine-house, turntable, coal-chute, water-tank, and cinder-pit for the locomotives. Day and night forces are employed at such points to provide for continuous service.

"Station service is organized quite apart from train service, although intimately associated with it. The person in charge of a station is known as the Station Agent, and where the business is sufficient to justify it he is assisted by a Telegraph Operator, a Ticket Clerk, a Baggageman, a Freight Clerk, and the necessary force of laborers for handling freight. In large cities the station organization becomes highly complex; the passenger and freight service is separated; departments take the place of individuals, and large forces of men are employed; but in principle there is no difference between the organization of a large and a small station, and in

freight service the person at the head of the station force is known upon all railroads as the "Agent." The methods which prevail in the handling of passenger traffic, both in station and train service, are so well known that it is not necessary to refer to them here.

"In freight traffic the station service is adjusted to conform to the two methods which prevail in the shipment of freight, namely, full car loads and less than car loads. In the case of car-load freight, the shipper loads the car and the consignee unloads it, the railroad furnishing no labor for the purpose. Cars containing car-load freight are placed for loading and unloading on public tracks conveniently located and accessible to teams, or are delivered directly to the private tracks of the different industries. Less than car-load freight is delivered by the shippers at the railroad freight-house, where it is received and loaded into cars, and at its destination is unloaded and delivered through the freight-house to the consignees by the employes of the railroad. The tariff rates for car-loading freight are much lower than for the smaller quantities shipped in less than car loads.

"When freight is received, whether in car loads or in packages, it is weighed, either upon track scales or on warehouse scales, to determine the charge to be made; and the weight, rate and charges are entered upon the way-bill which accompanies every shipment of freight to its destination.

"At the close of business for the day, the cars which have been loaded at large stations are gathered up by the yard engines and made into trains under the direction of the Yard Master, who computes the tonnage, and, when equal to the rating of the locomotive assigned, the train is delivered to the conductor with the

way-bills, and is ready for its trip on the road. While the conductor is comparing the way-bills with the numbers and initials of the cars and checking the tonnage of the train, his brakemen have coupled the engine, tested the air-brakes, and examined the doors and seals. The conductor then compares his train orders with those held by the engineman, enters his time of departure on the station register, and gives the signal to start."—*From "Lectures on Commerce," University of Chicago.*

EMPLOYES AT RAILWAY STATIONS

EMPLOYES AT RAILWAY STATIONS, THEIR QUALIFICATIONS AND DUTIES.

MESSENGER BOY.

*"With few exceptions a messenger boy is one whose parents are compelled to take him from school early in life, so that his earnings will help to defray the expenses of the family, and consequently he has but a part of a common school education.

"After securing a position, his first thoughts should be centered upon the business entrusted to him, promptly delivering all messages, etc., and never loitering along the streets talking with others. He should also consider all matters concerning the business which he hears in and about the office, or otherwise, strictly private both on and off duty.

"He should appear neat and clean, and his bearing toward the public, as well as those with whom he is directly associated, should be polite and respectful.

"When not engaged in delivering messages, etc., his time while on duty should be spent in the office, that he may promptly respond when needed, and, while thus disengaged, he should improve his education by the study of school books, and also turn his attention toward learning the art of telegraphy. Those above him cannot fail to recognize his ambition and they will willingly assist him.

"He may secure an old 'key' and 'sounder' and get some experienced hand to fix him up with a 'short

*From Houlihan's Handbook.

circuit,' on which to learn the characters used, and, by application at 'odd times' he can learn to 'send' fairly well, and in time will be able to catch the 'office calls' on the main line. Gradually he thus becomes familiar with the characters so that he can 'read' fairly well, then he has 'clear sailing' and practice is all that is required.

"In this way the months glide by and he continues to properly perform his duties, keeping up his practice in telegraphy until he becomes a fairly good operator, and he is then given a trial, most likely a 'night office' at some small station.

TELEGRAPH OPERATOR.

"On being installed as an operator his first duty should be to make himself familiar with the rules of the operating department, especially as to the movement of trains by telegraph and the special instructions which concern him or the station at which he is employed. He should make it a point to follow such rules and instructions himself and make no attempt to shield others who violate them, and should always endeavor to assist the dispatcher in every way he can.

"He should hold himself in readiness to answer his 'call' promptly, report the arrival and departure of trains, watch the wires and report quickly when they are in trouble, and the direction from his station, and keep careful watch of the location of trains so that he can give proper information to those who should know, without asking the dispatcher. He should be especially careful in the handling of 'train orders,' delivering them personally, and should always have a full set of signals in good order and convenient for immediate use.

"Although in telegraphing, as in all other pursuits of life, one's ambition should be to become proficient in it, his highest aim should not be to become a fast 'sender' that he may 'rush that fellow,' or a good 'receiver' so 'he cannot rush me,' for if this is practiced he is constantly in trouble and annoys the dispatcher and delays business, but he should establish habits of caution, accuracy and diligence, taking a good average 'gait' and keeping it. In this way more will be accomplished and the results attained will be much more satisfactory to all concerned.

"During all this time a fair proportion of his leisure hours should be spent in studying and reading the news of the day, and the balance should be judiciously employed in healthful recreations and moral pursuits, choosing only the best of companions. Many an otherwise bright young operator, becoming discouraged and seeking the companionship of those who he thinks will not notice his deficiencies in the matter of education (who as a rule are boys whose only ambition is to get through life with as little effort on their part as possible), is soon led to frequent saloons, gambling houses, etc. If an operator follows the latter course, he cannot long hold the position that he has, much less expect promotion, while if he is a moral young man, keeps good company, is kind and courteous to the public as well as his co-employes, attends strictly to business and looks after the interests of the company, his superiors will recognize in him a valuable man and he will be advanced step by step (in each position endeavoring to give better satisfaction than in the previous one) until he is entrusted with a 'trick' as dispatcher."

FREIGHT OFFICE MESSENGER BOY AND CLERK.

Clerical work in the different departments of a railroad, especially in the freight department, where the largest number of clerks are employed, presents an inviting field for a business career to the average boy who has received a fair common school education, as promotion will come naturally, provided the duties of each position are attended to conscientiously and in a prompt business-like manner.

The boy who has succeeded in securing a position as messenger in a freight office at any large junction or terminal station, when he reports for duty, will be handed over by the agent to the chief clerk, who will instruct him as to what his duties will be. He should bear in mind that the clerks in the office are men and should receive the respect that is always due from a boy to one older than himself, and although under instructions from the chief clerk, if another clerk in the office should ask him to perform any service that does not interfere with the regular duties assigned to him, he should cheerfully and quickly perform such service. By pursuing this course he secures the friendship and good will of all the clerks in the office, and if ambitious and anxious to learn, they will only be too glad to give him "pointers" about their work, and even allow him to help them at times. This will give him an opportunity to learn the work upon the different desks in the office, which he should take advantage of, with a view of being promoted to a junior clerkship after he has served his apprenticeship, so to speak, as messenger boy. He should also bear in mind that prompt obedience, polite answers, such as "Yes, sir," and "No, sir," and a neat

and tidy appearance, will greatly increase his chance for promotion.

In the course of time, when a vacancy occurs, or new clerks are added, due to increase of business, he will be given one of the minor desks in the office, generally that of expense bill clerk, or copyist on the bill desk. This copying work, on either of these desks, will give him a geographical knowledge of the country, which will become valuable later on, when occupying more important positions. He has now arrived at the age which is the most critical period in the life of every young man, and a great deal of his future success will depend upon, not only his application to business, but also his associations outside of the office after business hours. He should not seek his recreation and amusement in saloons and other disreputable places, as, if habits of frequenting them grow upon him, even though he does not become a slave to intemperance or a victim of other vices, his employer will sooner or later become aware of such practices, and they will figure against him, so far as future promotion is concerned, if they do not lead to his dismissal. On the contrary, by cultivating the acquaintance and society of respectable young ladies and gentlemen, and joining them in social amusements that do not interfere with his business, his career will be uninterrupted.

As time passes he will be advanced from one desk to another, taking in various positions, such as car clerk, where he will become acquainted with the rolling-stock of the different roads; claim and tracer clerk, where he secures a knowledge of correspondence, and methods of handling same; rate clerk, where he becomes conversant with the rates and classifications in use, and also

the workings of the different traffic associations, especially those of which his road is a member, etc., etc., continuing to give good service in each, until he is finally promoted to one of the two highest positions in the office, either cashier or chief clerk.

CASHIER.

The position of cashier in a freight office is one that requires a person of unbounded integrity who has a thorough knowledge of the system of accounts used by the company. All railroad companies require a good and sufficient bond from employes handling a large amount of the company's money, and most railroads require that this bond be furnished by a guarantee company. The young man will, therefore, have to fill out the blank application for bond of the guarantee company that does business with the road, answering numerous questions that are considered necessary, being careful to make his replies correct in every particular, as the slightest irregularity is sometimes thought by the guarantee company to be sufficient cause to refuse to issue the bond. A refusal of this kind would effectually bar further advancement, consequently too much care cannot be used to guard against it. After his application has been favorably considered and bond given, his habits and general conduct should be irreproachable, giving no reason whatever to the guarantor for withdrawal from his bond.

His duties will comprise the handling of all moneys received, the remittance of same to the treasurer, and the keeping of the accounts of the station. He should never allow himself to become careless in the handling

of money, as by such carelessness little errors will occur that lead to greater ones until he finds himself responsible for a large loss, which, even if he makes good, will cause him to be looked upon with more or less suspicion by the agent and the officials of the company.

By handling his work as if he expected the traveling auditor every day to check the station, he will find that it will reduce the clerical work of his own position and make a record for himself and the station that will be appreciated by the agent and the officials of the auditing and financial department, all of which will have an influence in placing him in a superior position when an opportunity presents itself.

CHIEF CLERK.

The position of chief clerk is the most important one at a large station, next to that of agent. A man should bring to this position not only a thorough knowledge of station business, but also some executive ability and a faculty of systematizing the office work so as to produce the best results with the least amount of labor, as he arranges the work of all the clerks and instructs them in their various duties. He should be familiar with all reports that are made to the different officials of the company, daily, weekly, etc., and should see that the clerks who make these reports send them in promptly at the times specified. He should see that the work of the office is evenly distributed among the clerks, and arrange when any one of them has an unusual amount of work upon his desk to give him the assistance of some other clerk, using good judgment and tact in a matter of this kind so that no one will be done an injustice.

He should endeavor to obtain the respect of the clerks in the office under his charge, and he can do this only by being impartial, making favorites of none.

He should enforce all rules of the office in a strict, business manner, and see that the office hours are strictly adhered to by all of the clerks, and in order to do this he should make it a point to reach the office himself, both in the morning and at the noon hour, ten to fifteen minutes before the regular time.

He should in fact fulfill the duties of his position exactly as he would like to have them fulfilled if he were agent. By so doing he will fit himself for the position of agent and can look forward with confidence to his promotion as such when a vacancy occurs.

FREIGHT AGENT.

"The position of freight agent at a large junction or terminal station is one of great importance, and the man selected for this position is usually discussed from every point of view, by officials in the operating, traffic and accounting departments, before he is appointed. He should have a thorough knowledge of freight traffic, financial and accounting matters, and if the duties of the freight agent include the charge of terminals, he should also have a good knowledge of the operating department, so far as the making up and handling of trains is concerned, etc.

"In addition to being conversant in such matters, in order to be successful, he should be a man of considerable executive ability and have the faculty of enforcing good discipline among employees under his charge.

"His success will also depend to a great extent on the

judgment he exercises in selecting his lieutenants, such as chief clerk, cashier, yard master and warehouse foreman. If he places good men in these positions, and then systematizes their work so that each one of them will understand his whole duty and co-operate with the others, there is no question but that he will have a model station, he, of course, exercising a watchful supervision over all.

"He should be familiar with all property and lands owned by the company within his jurisdiction; should see that its buildings are not misused, and should endeavor to have the team tracks and warehouse, and the driveways in and around same, kept in condition as good as, if not better than, those of competing lines, so as to make his station more attractive in the eyes of merchants and business men generally. In making suggestions, however, to his superintendent in regard to any improvement that in his judgment should be made in the warehouse, yards or buildings, he should show good reasons why such improvements appear to him to be necessary.

"He should conduct the service of the station according to civil service rules, having no favorites among the employees in any department, but giving them all to understand that length of service with the company, knowledge of the business, and good work, are the only roads to promotion. He should consider carefully every important matter that is brought to his attention, taking sufficient time to look at it from every point of view before making a decision, and should never undertake to settle any matter for the company that might involve it to any great extent without instructions from his superior officers, except in cases that require immediate

action, and in such cases he should report the facts to them promptly, giving full explanation as to his handling of the matter, and reasons for actions taken by him.

"He should pay particular attention to the expenses of the station, comparing the pay roll of each month with that of the previous month and with the same month in the previous year, and if there is any increase he should see whether or not the increased business as shown by the tonnage justifies the increase in expenses. He should endeavor to extend the business of the company in every direction, and in order to do this should cultivate the acquaintance of the shippers and merchants of his city, endeavoring to obtain their good will and patronage in every possible way consistent with the dignity of a gentleman. He should not stoop to untruths or deceit of any kind in endeavoring to get business, as such practices, while they may gain temporary advantages, will undoubtedly react against him and the company he represents. He should never make any definite promises unless he knows positively that they can be fulfilled, as every broken promise upon his part will more than counteract a half-dozen previous favors that he may have been able to extend to the shipper.

"An agent possessing the qualifications herein set forth is a valuable man for any railroad, and can reasonably expect that promotion will come to him, in the course of time, from either the operating or traffic department, in the shape of a superintendency of a division, or assistant general freight agency of the road."*

Describing the duties of a railroad agent in "Railroad Men," Mr. Geo. H. Stevens, General Agent New York Central, says:

*Houlihan.

"Success comes from a knowledge of details and the application of force to the subject-matter.

"Years ago when freight was billed under class rates, work was minimized, but now there are so many special, commodity and proportionate rates used that tariffs and special instructions have multiplied until the agent is obliged to carry a memorandum book in his pocket for ready reference.

"Admitting that an agent knows the letter of his instructions, he still finds it at time very difficult to understand them, on account of the style of phraseology used. Good judgment bridges the gap between no instructions and prompt action required, and in this particular the agent necessarily has to act independently of either.

"An agent receives instructions from the operating, transportation, traffic and accounting departments—which requires him to have a general knowledge of each.

"A systematic arrangement of labor is a factor not to be overlooked, for it is by systematically arranging force, and the application of energy, that results are obtained, particularly in the matter of expense.

"In the handling of men an agent finds the greatest use for the knowledge of details. He not only has to explain them, but must know that they are carried out in accordance with the general arrangement; otherwise results will not be satisfactory, and criticism, which often means an erroneous opinion of his capability, will follow.

"The requirements of the public are at times at variance with custom and rule, which is not an easy matter to explain satisfactorily. To obtain certain results, imposition is practiced indiscriminately. This requires the agent to use tact and diplomacy, which reminds him that

his position is one to serve, not only the Company by whom he is employed, but the public as well.

"Responsibility is only a matter of self-reliance, but not every one can adapt himself to it.

"While opportunity plays a prominent part in achieving success, it requires knowledge to take advantage of it.

"Personal habit has much to do with every man's future, particularly so if he would become a leader of, or have control over, others.

"At times recognition seems very remote, but there is always an opportune time, and one's ability is bound to be recognized sooner or later."

RAILWAY TELEGRAPHY AND TELEPHONY

THE TELEGRAPH.

The word "telegraph" means literally "to write afar off." That is, one man can speak to another though thousands of miles intervene. He can send his thoughts over deserts, through forests, over mountains and under oceans. But in order to do this he must harness an unseen *force* called *electricity.* What this unseen force is no man knows; but he does know to a certain extent what it is capable of; and, accordingly, he uses it to the best of his knowledge and ability.

Electricity is thus defined in Webster's International Dictionary:

Electricity means a power in nature, a manifestation of energy, exhibiting itself when in disturbed equilibrium or in activity by a circuit movement, the fact of direction in which involves *polarity,* or opposition of properties in opposite directions; also, by attraction for many substances, by a law involving *attraction* between surfaces of unlike polarity, and *repulsion* between those of like; by exhibiting accumulated polar tension when the circuit is broken; and by producing heat, light, concussion, and often chemical changes when the circuit passes between the poles or through any imperfectly conducting substance or space. It is generally brought into action by any disturbance of molecular equilibrium, whether from a chemical, physical or mechanical cause.

Electricity is manifested under the following different forms: (a) Statical electricity, called also frictional or common electricity, electricity in the condition of a

[Signals Governed through the Telegraph.]

stationary charge, in which the disturbance is produced by friction, as of glass, amber, etc., or by induction. (b) Dynamical electricity, called also voltaic electricity, electricity in motion, or as a current produced by chemical decomposition, as by means of a voltaic battery, or by mechanical action, as by dynamo-electric machines. (c) Thermo-electricity, in which the disturbing cause is heat (attended possibly with some chemical action). It is developed by uniting two pieces of unlike metals in a bar, and then heating the bar unequally. (d) Atmospheric electricity, any condition of electrical disturbance in the atmosphere or clouds, due to some or all of the above mentioned causes. (e) Magnetic electricity, electricity developed by the action of magnets. (f) Positive electricity, the electricity that appears at the positive pole or anode of a battery, or that is produced by friction of glass, called also *vitreous electricity*. (g) *Negative* electricity, the electricity that appears at the negative pole or cathode, or is produced by the friction of resinous substances, called also *resinous electricity*. (h) Organic electricity, that which is developed in organic structures, either animal or vegetable, the phrase *animal electricity* being much more common.

Having stated in brief terms the different forms under which electricity is manifested, we pass at once to the use of this wonderful force in nature when used as a means for telegraphing.

A volume could be written on the history and development of the telegraph. But it is not the purpose of the editors of this work to go into its history and development, therefore the subject of railway and commercial telegraphy as it is conducted in modern American railway practice will be at once taken up.

Doubtless, the mysterious and apparently unintelligible language of the station telegraph, as its letters and words are clicked off at a rapid rate, has first served to attract many youths and young men to take an interest in railway station work. Often it has proved to be the stepping stone to employment, and in numerous instances a knowledge of telegraphy has served as a solid foundation for a wide range of railway knowledge. Many an official holding a high position of great responsibility began his career in the railway profession by learning telegraphy.

The instructions and exercises which here follow will enable any one who will be diligent in application and patient in effort, to fully master its seeming mysteries, and, in time, to become an efficient telegraph operator.

INSTRUCTIONS FOR BEGINNERS.

No duties devolve upon the operator which persons with ordinary ability cannot perform if they give careful thought and study to the work, which is no more than is expected of anyone who wishes to succeed in any profession of life.

No business or profession can be learned in a day; and telegraphy requires much careful thought and practice, together with untiring application. Do not expect to absorb telegraphy. Great results cannot be expected from little labor. If telegraphy is worth learning at all it is worth learning well. Do not aim to be as good an operator as some person you happen to know, but strive to be a little better; then you will never be looking for a job, as the profession of telegraphy recognizes only ability. Much depends upon getting started well and

laying the proper foundation. Never leave a point or lesson until you have completely mastered it and have it thoroughly fixed in your mind; some elementary principles hurried over or neglected will debar one from making the progress anticipated.

There always has been and always will be a great demand for competent operators. Success in life depends upon being ready when the opportunity comes.

LEARNERS' INSTRUMENTS AND HOW TO CONNECT FOR PRACTICE.

The only instruments required for a person to begin the study are the ordinary Morse Key and Sounder on the same base or separate, and the battery for generating the electricity. The dry battery will be found very satisfactory for working one instrument for practice. When the instrument is not in use the circuit should be left open, as a dry battery soon loses its strength when left on a closed circuit. The circuit closer is often removed from the key when a dry battery is used, as this will avoid any chance of the circuit being left closed when the instrument is not in use. For the line work the gravity battery will be found to give better satisfaction because the circuit must be kept closed. The instrument arranged on the same base will be found to have two binding posts to receive the ends of the wires. To connect an instrument of this kind for practice it should be securely fastened to the table at a position where it can be reached, leaving room for the arm to rest upon the table while sending; small holes should be bored opposite the two binding posts for the wires; connect a wire to one of the binding posts of the instrument and the

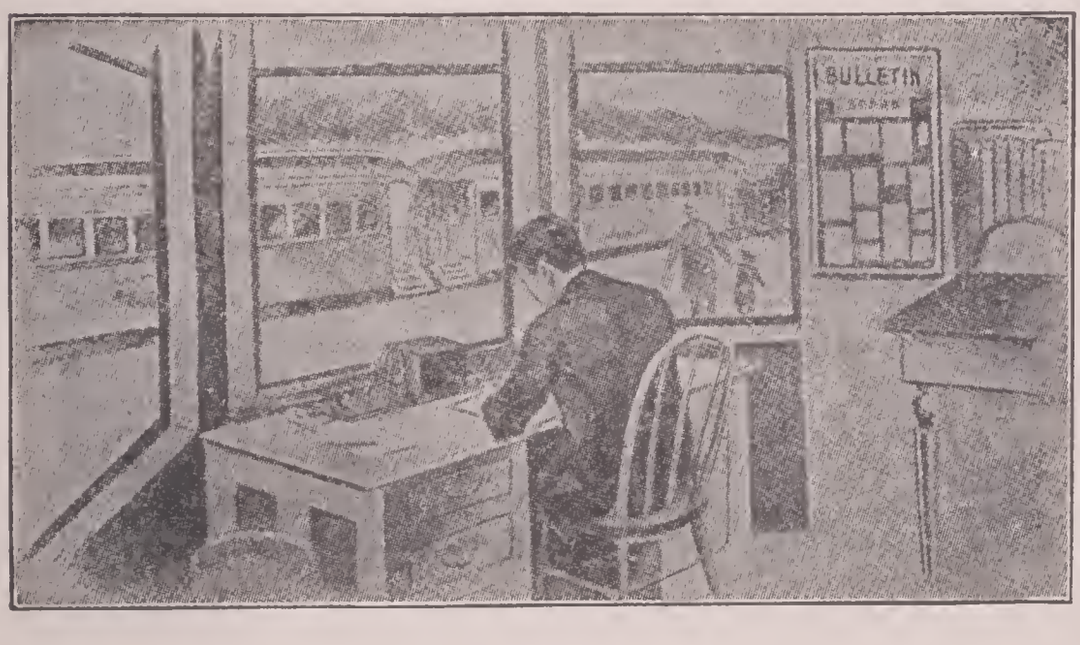
other end to one pole of the battery, from the other pole of the battery connect a wire to the other binding post of the instrument.

If two instruments of this kind are to be connected for line practice, connect a wire to the zinc pole of the first battery, thence to one binding post of the first instrument, from the other binding post of the first instrument to one binding post of the second instrument, from the other binding post of the second instrument to the copper pole of the first battery; if more than two batteries are to be used the batteries should be connected, running from copper to zinc and zinc to copper, zinc should never be connected to zinc or copper to copper, as they will neutralize each other and no circuit be produced.

If the key be separate from the base of the sounder it is better to arrange the key a little to the right-hand side, in such a position that it can be reached while the arm rests on the table in sending; place the sounder at the left-hand side; to receive the wires small holes should be bored opposite the two binding posts of the sounder and for the legs of the key. Connect a wire to one binding post of the sounder, the other end to one pole of the battery, from the other pole of the battery connect a wire with one leg of the key on the under side of the table between the two washers in order that good connections may be had; from the other leg of the key connect a wire to the other binding post of the sounder.

To connect two separate keys and sounders together for line practice begin by running a wire from one binding post of the first sounder to the copper pole of the first battery, from the zinc pole of the first battery to one leg of the first key, from the other leg of the first key to

one binding post of the second sounder, from the other binding post of the second sounder to the copper pole of the second battery, from the zinc pole of the second battery to one leg of the second key, from the other leg of the second key return the wire to the remaining binding post of the first sounder; this last wire is known as the return wire and will work much better on a short circuit than the ground wire.



Ground wire may be used by connecting the last leg of the second key with the earth, also the remaining binding post of the first sounder with the earth. Explanation of how to fix a ground wire will be found under the heading of "Ground Wire."

THE MORSE ALPHABET.

Morse in the arrangement of his telegraphic alphabet took as a unit of space or length the shortest possible length of time, technically termed a dot. He then made

his alphabet, formed from three elements: the dot, the space, and the dash, arranged in various combinations representing the following relative values:

The dot .....One unit
The break between the elements of a letter....One unit
The space, employed in the "spaced letters"..Two units
The space, separating the letters of a word..Three units
The space separating words.....Six units
The short dash .....Three units
The long dash .....Six units

The student should commit the alphabet to memory without reference to position of other characters, so each can be called to mind at will without hesitation before commencing to practice them; when once the letters are thoroughly memorized so that the mind has nothing to do but attend to the mechanical movement, learning at the instrument will be found much easier and more rapid.

LETTERS.

NUMERALS.

1	2	3	4	5
·– – – –	·· – – –	··· – –	···· –	·····

6	7	8	9	0
– ····	– – ···	– – – ··	– – – – ·	– – – – –

PUNCTUATION, ETC.

period [.] ·–·–·–

comma [,] ·––·––

interrogation [?] ··––··

exclamation [!] ––·––

paragraph [drop a line] ––––

colon [:] –·––·

colon dash [:—] –·––·––

colon quotation [:"] –·––·–·

semi-colon [;] –·–·–·

hyphen [-] –····–

dash [—] ––··––

beginning quotation ["] ·––·–·

ending quotation ["] ·––·––·–·

apostrophe ['] or quotation within a quotation [" ' ' "] ·––––·

beginning parenthesis [(] –·––·

ending parenthesis [)] –·––·––·

brackets ([]) –·––·––

capitalized letters ··––··

italics or underline ··—·—··

dollars [$] ···—··—

cents [c] ·—·

decimal point [.] —·—·—

pound sterling [£] ·····—·—···

shilling mark [/] ·—··—·

pence [*d*] —··

TRANSMISSION.

Transmitting or "sending" is the first requirement necessary for the beginner, and is the art of forming telegraphic signals upon an instrument called a key which being connected with Relay, Sounder and Battery produce sound signals which are arranged in the form of an alphabet, enabling us to send communications, one to another, at various distances.

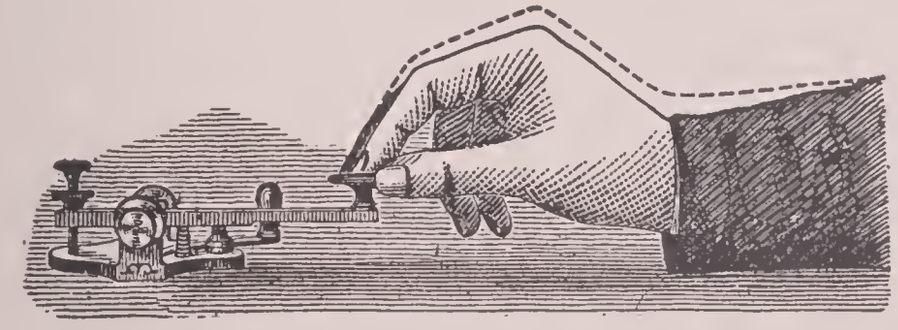
The student should bear in mind that in order to be accurate with his sending is of greater importance than his speed. Take great care that you send slowly at first, striving for a firm, even, smooth style of sending. Speed will come by practice; never to send more than one-third faster than you receive is a splendid rule for any beginner, and if strictly adhered to will in time make you a more correct sender than any rule that can be laid down. The customary idea that sending is more easily and more readily learned than receiving is entirely wrong, because a person, unless he or she be able to read ordinary rapid work is unable to be a good judge of sending, therefore will not be able to correct their own sending as it should be until after receiving be learned.

The custom of timing for the purpose of finding the

rate of speed attained should be seldom indulged in except under the careful direction of his or her instructor, as it is apt to cause the student to become careless in the formation of characters.

POSITION.

Place the two first fingers on the farthest side of the key-button with the thumb under the edge; curve the first and second fingers so as to form a quarter section of a circle; partially close the third and fourth, but not enough to cramp them; never allow them to touch the table. Rest the arm on the table at the elbow; let the grasp upon the key-button be firm but not rigid; while sending never allow the fingers or thumb to leave the key or the elbow to leave the table. Learn to handle the key as easily as you would a pen.



POSITION OF HAND AND MOVEMENT.

Fig 1.

MOVEMENT.

The motion should be directly up and down, avoiding all side pressure; it should be made principally at the wrist, although the fingers and hand should be perfectly limber; the fingers, hand and arm should move uniformly in the same direction.

Tapping upon the key should be carefully avoided and never try to write with the finger movement alone; the fingers are used merely as a leverage and to hold the key-button.

The downward movement produces the dots and dashes, while the upward movement the breaks and spaces. A dot (.) is made by a single instantaneous downward stroke of the key, while a dash (—) is made by holding the key down as long as it would take to make three dots; a long dash as in the letter L or the numeral cipher o should be made by holding the key down as long as it would take to make five and six dots respectively.

The space is produced by the upward movement of the key and consists of four different lengths which indicate the intervals between the elements of a letter, between the letters of a word and between the words in a sentence. The first, or break, is one unit in length and is the instantaneous interval between the dots and dashes of a letter and is found in every letter and character except E, T, L, O, and the numeral cipher. Second, the space in the space letters, which are six in number, O, C, R, Y, Z, and the character (&), is given two units in length, or equivalent to one dot and break; great care should be given to the correct transmission of the space letters; the letter O should require the same time as the letter S, the letters C and R the same time as the letter H, the letters Y, Z and the character (&) the same time as the letter P. Third, the space between the letters of a word is three units in length, or equal to two dots and breaks; an exception to this rule may be made in case of the double E, which should be nearly the same as between words. Fourth, the space between words is six units in length, or equal to three dots and break.

EXERCISES IN SENDING.

After the student has made careful study of the preceding subject and has a thorough knowledge of the arrangements of the alphabet spacing, correct position, how the wrist is to be used in the movement, the following exercises should be practiced in their regular order. Much success in sending depends upon these exercises being thoroughly mastered in regular order, as each is the key which unlocks the exercises following, therefore each and every character should be repeated over and over until it can be made at will and without mistake before the next exercise is taken up.

FIRST EXERCISE.

Learn the movement first on dots, make one each second, then two and three each second with as much regularity as possible and gradually increase until a speed of 360 per minute can be made with as uniform order as the tick of a watch.

. . . . . .

Separate the dots representing the letter E.

. . . . . .

SECOND EXERCISE.

Learn the movement on dashes by commencing at the rate of about one a second and gradually increase until a speed of about 115 per minute can be made uniform and with ease. Special care should be taken to make the breaks between the dashes as short as possible. If a good, free movement is used the dashes cannot be made too close together. The tendency is to space dashes and great care should be taken to overcome this; remember

where there are no spaces, the characters must be made compactly together. Hold the key down the length of three dots for the ordinary dash or long enough to pronounce the word "seat."

- - - - - - - - - - - - - - - -

Separate the dashes representing the letters T, L and the numeral cipher 0.

- - - - - - - - - - - - - - - -

— — — — — — — — — —

— — — — — — — — — —

THIRD EXERCISE.

Make a dash closely followed by a dot representing the letter N. This exercise will be found more difficult; be sure that the dash *is* a dash and the dot a dot and make them compactly together; it might be timed by pronouncing the word NINE-TY, holding the dash while the first syllable is pronounced and making the dot when pronouncing the last.

—. —. —. —. —. —. —. —. —. —.

FOURTH EXERCISE.

Make a dot closely followed by a dash representing the letter A. There is a great tendency to space this character and make the dot too long and the dash too short; watch it closely. It might be timed by pronouncing the word A-GAIN, making the dot while saying A and the dash while saying GAIN.

·— ·— ·— ·— ·— ·— ·— ·— ·— ·—

FIFTH EXERCISE.

e	i	s	h	p	6
o	c	r	y	z	&

SIXTH EXERCISE.

t	l	m	5	0
a	u	v		4
n	d	b		8

SEVENTH EXERCISE.

f	g	j	k	q
w	x	1	2	3
	7		9	

EIGHTH EXERCISE.

period [.]	comma [,]	interrogation [?]
exclamation [!]		paragraph [drop a line]
dollars [$]	cents [c]	decimal point [.]

NINTH EXERCISE.

colon [:] — colon dash [:—]

colon quotation [:"] — semi-colon [;]

hyphen [-] — dash [—]

beginning quotation ["] — ending quotation ["]

apostrophe ['] or quotation within a quotation ["' '"]

beginning parenthesis [(] — ending parenthesis [)]

brackets ([]) — capitalized letters

italics or underline

pound sterling [£] — shilling mark [/]

pence [*d*]

FORMATION.

The letter j should be formed as tae; k as ta, q as ue, x as ai. The numeral 1 as we, 2 as ui, 3 as ve, 9 as tu. The period as ud, comma as aa, interrogation as tue, beginning quotation as qn, ending quotation as qj, beginning parenthesis as pn, ending parenthesis as pj, brackets

as bx, hyphen as hx, dash as dx, colon as ko, semi-colon as si, colon-dash as kx, colon-quotation as kq, capitalized letters as cx, dollar mark as sx, cents as c, decimal point as tw, italics or underline as ux, apostrophe, or quotation within a quotation, as qx, pound sterling as px, shilling mark as ut, pence as d.

TENTH EXERCISE.

Air, care, thanks, maple, use, keep, injuries, young, frequently, zinc, next, verily, cottage, error, erie, loop, little, practically.

ELEVENTH EXERCISE.

Use a good free movement in this exercise:

Every good student employs every moment of his time.

Be an honest and faithful worker, doing your best and never grumbling.

Firm and smooth sending goes hand in hand, speed comes from practice.

TWELFTH EXERCISE.

A comma or a space is used to divide numerals into hundreds, thousands, etc. The abbreviations hnd, tnd, mln or myn are used for transmitting ciphers; hnd, stands for two ciphers, tnd for three ciphers, and mln or myn for six ciphers. Example: 500 would be transmitted (5hnd); 4,000 (4tnd); 3,000,000 (3mln); 300,000,000 (3hnd mln).

79, 8,610, 23,100, 405,631,000, 900,000, 215,000,647.

THIRTEENTH EXERCISE.

In fractions the letter E or dot is used for the dividing or fraction line. Example: the fraction ½ would be transmitted 1 e 2 3-32 as 3 e 32.

1-2, 1-3, 2-5, 7-8, 3-16, 11-12, 10-32, 2 1-2.

FOURTEENTH EXERCISE.

The decimal point is transmitted by either using the decimal point character which is formed of the letters TW or by spelling out the word Dot, the word DOT is most commonly used. The dollar mark is SX. Example: $133.53 would be transmitted SX 133 dot 53.

3.5, 99.4, $1.23, $51.46, $826.98, $400.10½.

HINTS IN SENDING.

In telegraphy, the same as in penmanship, a careful and thorough study of the movement should not be slighted; the more attention given the correct position and movement the better and faster will be the gain in sending. Firm, smooth sending should be attained at the expense of time and practice. The great idea among beginners, is that it is an easy matter to learn to send and that to be able to send and receive rapidly is all that is required; hence, they neglect the necessary careful practice which should be employed to gain proficiency in sending, but on the other hand acquire a habit of careless sending which is caused by sending too fast with no regard for uniform spacing or proportion of characters to each other. Some are inclined to put the characters in letters too closely together, which creates

jerky, uneven sending, which is not only hard to copy but hard to read; thus we are unable to tell what they are going to make until the last letter of each word is received; on the other hand, with good, firm, even sending it is possible to tell when "press" is being sent some few words ahead what the sender is going to make.

Uniform spacing is of the greatest importance in making sending easy to read. This applies to the characters in letters, between letters in words and between words in sentences. Remember when there are no spaces in the letters, the dots and dashes should follow each other closely.

A very good rule for a beginner to observe in order to get good spacing between letters in words and words in sentences, is to pronounce each letter after it is made, then the word after you have pronounced the last letter of each word; you will note if you pronounce the last letter of a word after you make it and then the word, you will be giving about twice the space between the words that you do between the letters of the words, which is correct.

Due caution should be exercised in transmitting words which contain either all dot letters or a number of them together. The spaces should be longer than usual between the letters in the following words, as well as a great number of similar ones. Be sure and make them slowly and distinctly, as: seen, choice, error, piece, price, voice, bicycle.

A decided distinction should also be made wherever the letter "t" follows the letter "l," or *vice versa,* as in the following words: title, altogether, little, altitude, battle, alternate.

If an error is made in sending, the interrogation mark

should be made as a "break." If an error is made on the first letter of a word, make the interrogation mark and repeat the word immediately preceding it; if on any other letter of the word, make the interrogation mark and repeat only the word in which the error was made. In case a different word than the one which appears on the copy has been sent make the interrogation mark followed by the abbreviation "msk."

PUNCTUATION.

Punctuation marks are not always sent as they would appear in print or as they should be used. The period is very seldom used except at the beginning of the body of a message or train order. The comma is perhaps most used, and often used in place of the period and conveys several meanings according to where it is placed; take for instance after the two or three lines of the address of a message, it is used and means the same as "Drop a line." The interrogation or question mark is many times used out of place; for instance if an operator miss what is being said to him he uses it, meaning "What did you say?" or if he makes a mistake in transmission he uses it as a break, or if he be sending a message and wishes to explain something he uses it there. Punctuation marks should always be sent at nearly twice the rate of the other sending and should be made compactly together as one letter. Punctuation marks are not used after abbreviations or initials; example: Mrs. J. H. Brown, N. Y.

RECEIVING.

After all the letters and characters have been thoroughly memorized so that the student can send readily and correctly, receiving may be then taken up. It is necessary in receiving that another person manipulate the key which operates the sounder; the one receiving should not watch the hand of the sender or the lever of the sounder; let your receiving be done by sound from the very start. The person sending should send slowly and distinctly, the one receiving naming each letter as sent; this practice of calling each letter should be kept up until the speed is so fast that the receiver has not time to pronounce the letters; then the receiving of words may be taken up, pronouncing each word as sent until able to receive from twelve to fifteen words per minute, counting five letters to a word. Then commence the practice of sentences, press, train orders, messages, etc. The student should bear in mind that there is no change in the tone of the sounder, the letter being determined by the time or times the lever is up or down. The sound produced by the upward movement of the lever is as necessary in receiving as the sound produced by the downward movement of the lever, for without it the duration or length of dashes could not be determined. The sound made by the upward movement of the lever is dull and will not confuse the student when he puts his mind on the downward movement for the dots and dashes and the upward movement for the breaks and spaces. To become a good receiver of rapid sending it is necessary that the receiver be able to copy behind the sounder several words; this

will be found quite difficult for the beginner and much time should be employed in dividing attention between receiving and copying, only a letter at a time may be the starter but with unwearied application the student can advance from one letter to several words. The practice of copying five words to each line when copying with a pen or pencil should be commenced early in the work, as it will be found very useful when the subject of messages is taken up.

Read the daily papers, markets, etc., and familiarize yourself with every line of business; study the names of different towns and work hard on the spelling of the same, and receiving will become easier.

PENMANSHIP.

The subject of penmanship is not given proper attention by the student of telegraphy. A good, legible business handwriting is a very desirable accomplishment in any occupation, but nowhere is it more needed than in the telegraph business, because your handwriting must be handed out to the general public to read, and so we would earnestly request that you waste no time beginning to carefully prepare for this all important part of the work. Upon applying for a position about the first thing asked is "let me see your handwriting." We would not attempt to lay down any rules in regard to penmanship, only give a few suggestions.

Ornamental styles, and graceful and shaded curves are entirely out of place in the telegraph business. What is needed is to make the letters of the shortest length practicable, without curves where it is possible to retain the general outline of the letter without them.

Hold the pen as close to the paper as possible and use a full muscular movement. Adopt as a standard, one plain simple form for each letter and figure, and always use the same form. It is a customary idea with beginners in telegraphy that to have from three to five different forms for each letter will enable them to gain faster speed; this is wrong, as you would have too many forms to learn, "a sort of jack of all trades and a master of none." A medium or small hand is written with more ease and rapidity than a large hand from the fact that the pen can be carried over short spaces in less time than over complicated ones. We sometimes think that good penmanship is a natural gift to some, but all can by patient and studious efforts and careful study of all letters and figures be able in time to write a plain, readable hand.

BATTERY.

The gravity or what is more commonly known as the crow-foot battery is one most generally used for the production of electric current for telegraph purposes; although during the last few years dynamos have been introduced into the production of electricity for the telegraph and to a certain extent have lessened the use of the gravity battery in the larger offices.

The gravity battery consists of a glass jar, a zinc, and a copper plate. The zinc is the positive plate and the copper is the negative plate. It must be remembered that the positive current always moves away from the battery and the negative returns toward it even if we have the circuit grounded. The current starts from the zinc plate (which dissolves or is eaten away), then through the solution to the copper plate and finds its

outlet through the wire which leads from the copper and we have the positive current to the line coming from the copper plate and the negative current returning to the zinc pole of the battery; hence positive means copper to the line and negative zinc.

Battery.

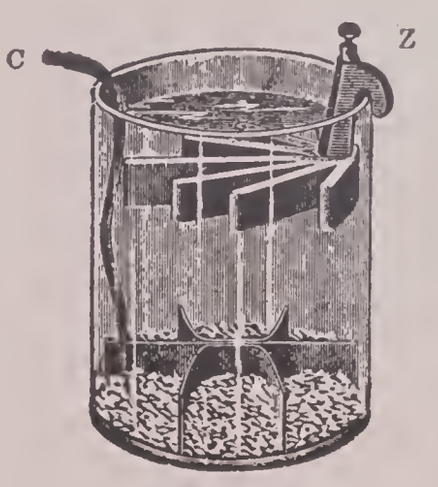


Fig. 2.

The arrangement of the battery is as follows: the leaves of copper are spread and placed at the bottom of the jar and should be nearly covered with blue vitriol; the zinc suspended from the top of the jar and the jar filled with soft water to within an inch from the top; it will require from three to four days for a battery of this nature to work up to full strength, the circuit of course being closed. When a battery is in good working order if the circuit can be left open when not in use, it will strengthen and greatly save the battery.

About every two to four months the zinc and the copper should be taken out and thoroughly washed and cleaned and the clean liquid poured into a clean vessel, and the dirt which has accumulated by the decomposition

of the zinc plate thrown out, and the jar cleaned. Arrange the battery as before, adding more vitriol, and pouring in the clean liquid and enough water to make the battery complete.

CONDUCTORS AND INSULATORS.

Those bodies are commonly called conductors which conduct electricity readily; metals, water, charcoal, and animal bodies. Among the metal conductors, silver, copper and gold are the best; the two former will conduct about five times as well as iron or platinum. The principal conductors used are copper, iron, brass and platinum.

Those bodies are insulators which conduct slowly; glass, sulphur, resin, ice, dry-air, dry-wood, varnish, porcelain, etc., any of these bodies will conduct under certain conditions or when covered with moisture.

MAGNETISM.

Magnetism is that form of electricity which exists in the magnet or load-stone. The electrical action is supposed to travel in circles or lines around bodies which it may traverse. Thus it was discovered if a piece of steel or hard iron be encircled by fine insulated wire and an electric current applied to the wire the iron would become magnetized and remain a magnet, as hard iron or steel when once magnetized will retain its magnetism for a long time; therefore soft cores of iron are always used for electro-magnets, as soft iron can be magnetized and demagnetized several thousand times a second.

ELECTRO-MAGNET.

The Electro-Magnet consists of two cores of soft iron about the size of an ordinary lead pencil, upon which is wound a great many feet of fine insulated copper wire, each core being wound in the same direction and covered with a casing of polished, vulcanized rubber having heads of the same material, thus making spools of each; and screwed to a flat connecting bar known as the heel piece; both inside ends of the wires are connected together, and the outside ends of the wire are

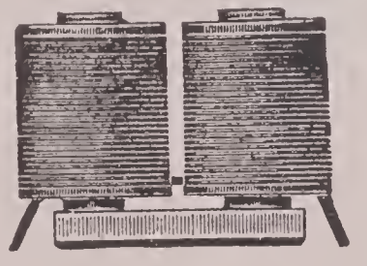


Fig. 3.

connected together and the outside ends connected to the instrument binding posts to receive the wires which conduct the current. When the circuit is closed, the current by passing through the turns of the wire called the "helix of the magnet" causes the soft cores of iron to become magnetized, possessing the power of attracting with considerable force any piece of iron brought near the ends and ceasing when the circuit is open.

THE KEY.

The principal use of the key is to open and close the circuit to produce the dots and dashes. It is a mechanical device manipulated by hand to transmit telegraph

signals. It consists principally of a metallic lever upon a trunnion supported by screws on the elevated sides of a metallic base. Beneath the base are two metallic legs which extend through the table; these legs hold the key firmly to the table and connect with the two ends of the main line wire. The front leg and lip is separated from the base of the key by a non-conducting material which insulates it from the frame, so the current cannot pass through, except when the lever is down or the circuit closer under the lip. On the top and in the

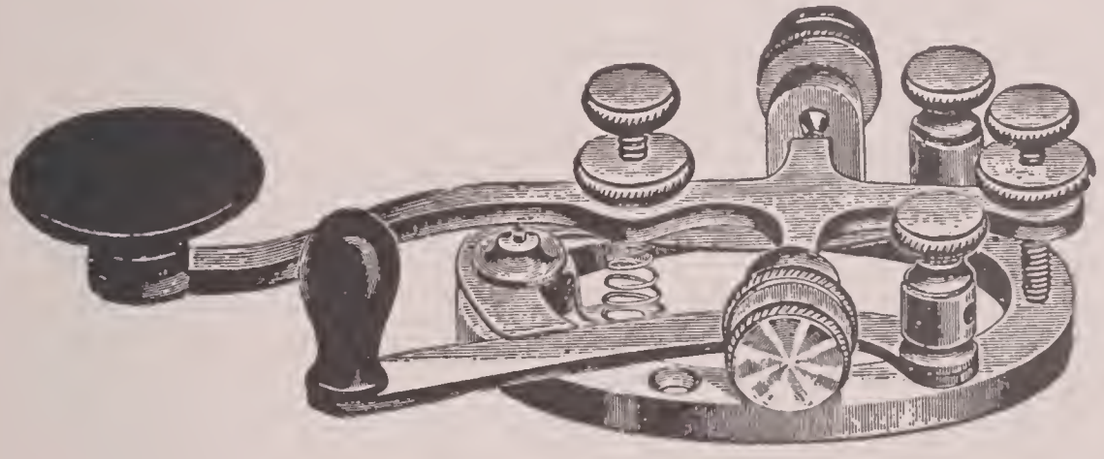


Fig. 4.

center of this is inserted a small piece of platinum; above this on the under side of the metallic lever is another piece of platinum. The spring is arranged to separate the two platinum points, thus opening the circuit. A metallic arm or circuit closer is attached to the base of the key near the second leg, so arranged that it can slide under the lip directly connected with the first leg, thus closing the circuit when the key is not in use. To prevent the operator from receiving an electrical shock the finger pieces of both the level and the circuit closer are of non-conducting material.

THE RELAY.

The chief use of the relay is to resist all over-production of current. It has its connections with both main line and local circuits. It consists of an electro-magnet horizontally arranged upon wood and metallic base; the small magnet wires go through the base and connect directly with the main line binding posts. In front of the electro-magnet a metallic armature with a platinum

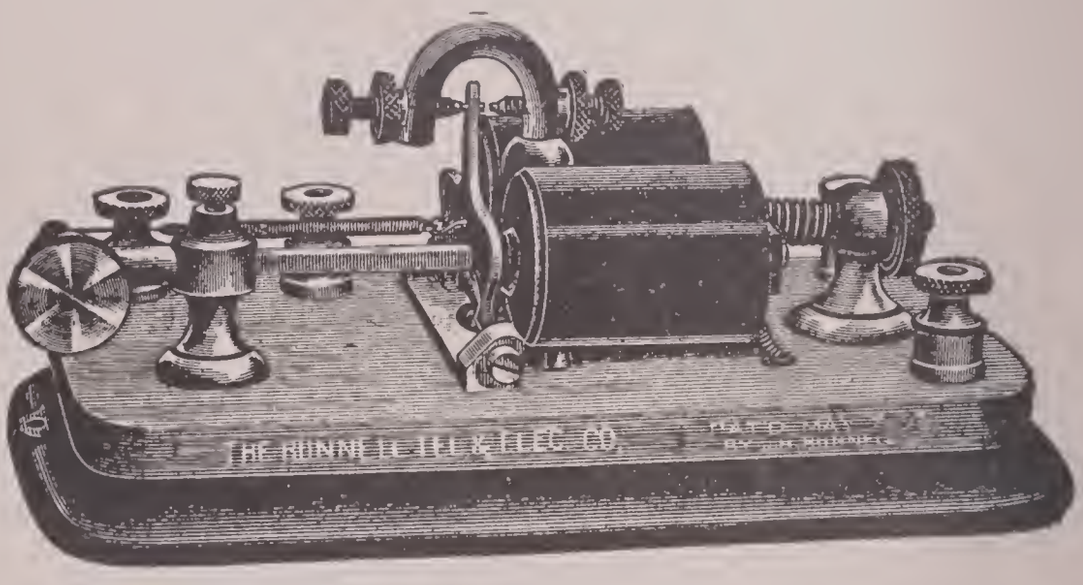


Fig. 5.

point in its lever (connected by a fine wire running through the base to one local binding post) is perpendicularly arranged to work freely by the action of the electric current produced in the magnets, which strikes against a platinum point arranged in the adjusting screw, in the yoke or frame (which is also connected by a fine wire running to the other local binding post) which closes the local circuit through the sounder, which also has its connection with the local binding posts and the battery. One other adjusting screw in the yoke or

frame with an insulated point, governs the play of the levers from the magnets. An adjusting spring is attached to the armature and its purpose is to draw the lever away from the magnets when the magnets are de-magnetized.

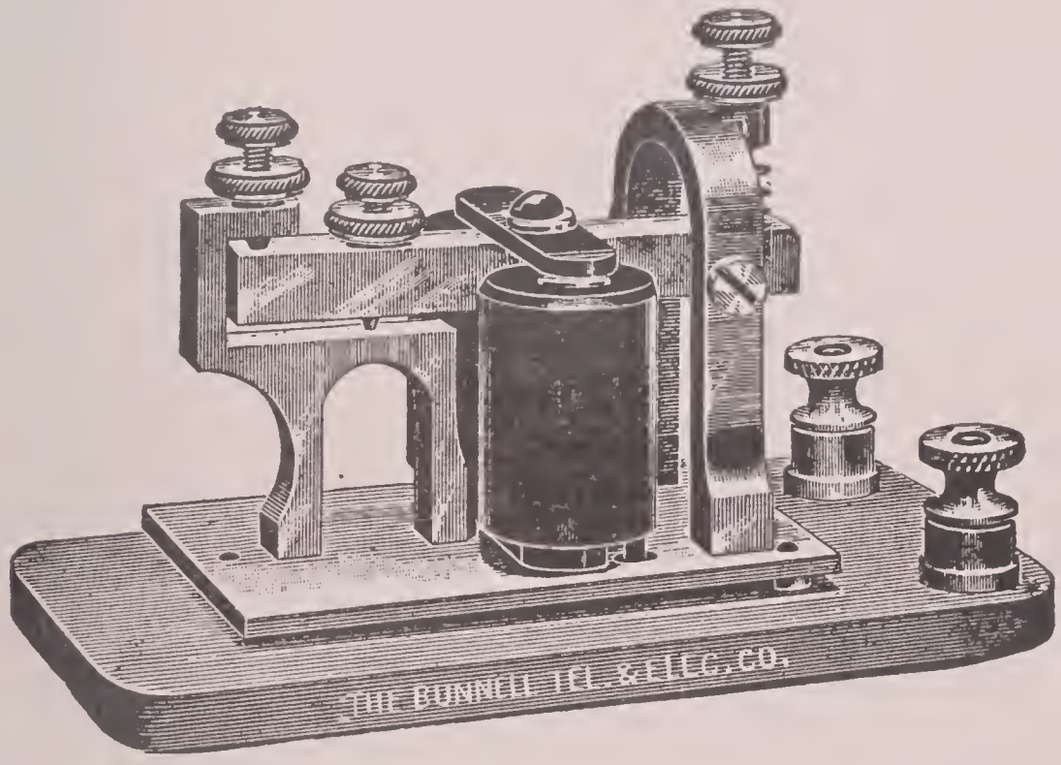


Fig. 6.

THE SOUNDER.

The chief use of the sounder is to aid the receiving operator. It consists of an electro-magnet perpendicularly arranged upon a metallic frame, which is securely fastened to a wooden base. The fine wires of the electro-magnet are connected by running through the wood and metallic base to the two binding posts. Directly above the electro-magnet an armature is horizontally arranged upon a lever in a frame to work freely by the action

of the electric current. A spring is used to draw the lever away from the magnet when the circuit is open. There are two adjustable screws, one in the lever which governs the movement toward the magnet; the other in the frame which governs the reverse movement. The sounder is connected with the local circuit only; having its connections attached with the two local binding posts of the relay and the two poles of the local battery.

ADJUSTMENT OF INSTRUMENTS.

THE KEY.

The movement of the key should always be free: that is, do not have the side screws tight enough to bind the lever and not enough of the reverse movement to allow it to play with a side movement. See that the platinum point in the lever strikes the lower point in the front leg squarely on top and keep them free from rust and dirt. The distance between these two points should be equal to the thickness of three to five pieces of ordinary writing paper; this movement being changed by the adjusting screw in the end of the lever, the spring should be strong enough to separate the two platinum points readily, but will vary with the person using the key.

THE RELAY.

The relay is the most difficult of the ordinary telegraph instruments to adjust. In most relays the magnet itself can be moved backward and forward, thus adjusting its position in front of the armature according to the strength of the current. A strong current requires that the magnet be drawn farther away from the armature and a weak current the reverse. The magnet should never be brought close enough to the armature to prevent the two platinum points striking firmly. It is necessary that the armature be upright and that the two platinum points strike each other

squarely; these points should be kept free from dirt. The play between these points should be from one to three sixteenths of an inch. In wet or damp weather, especially in storms, variations in currents occur when the line is not perfectly insulated, the spring requiring very careful adjustment. It should be tightened enough to draw the armature away from the magnet when the magnet is de-magnetised. The spring adjustment is known as high or low adjustment. A strong current requires a tightening of the spring, or high adjustment, and a weak current the reverse.

THE SOUNDER.

The adjustment of the sounder is similar to that of the relay, only the local circuit attached is not subject to change on account of weather and the armature always remains the same distance from the magnets; it should be as close to the magnet as possible without actually touching it. The play of the lever to and from the magnet depends upon the strength of the current attached, a strong current will admit of more play than a weak one; this play, however, can be too great to give clearness; the spring should be strong enough to draw the lever away from the magnet with all the force possible and still allow the lever to work freely.

THE SWITCH BOARD.

The switch board is a combination of switches adopted to form various combinations of several different circuits. By its use every possible change of circuit or connection can be quickly and easily made, instruments changed

from one wire to another; batteries connected or reversed; loops connected or disconnected and wire-testing operations carried on. It is used in nearly all telegraph offices where there is more than one wire. Probably the switch-board most generally used in this country is the pin plug switch-board. On the front of the pin plug

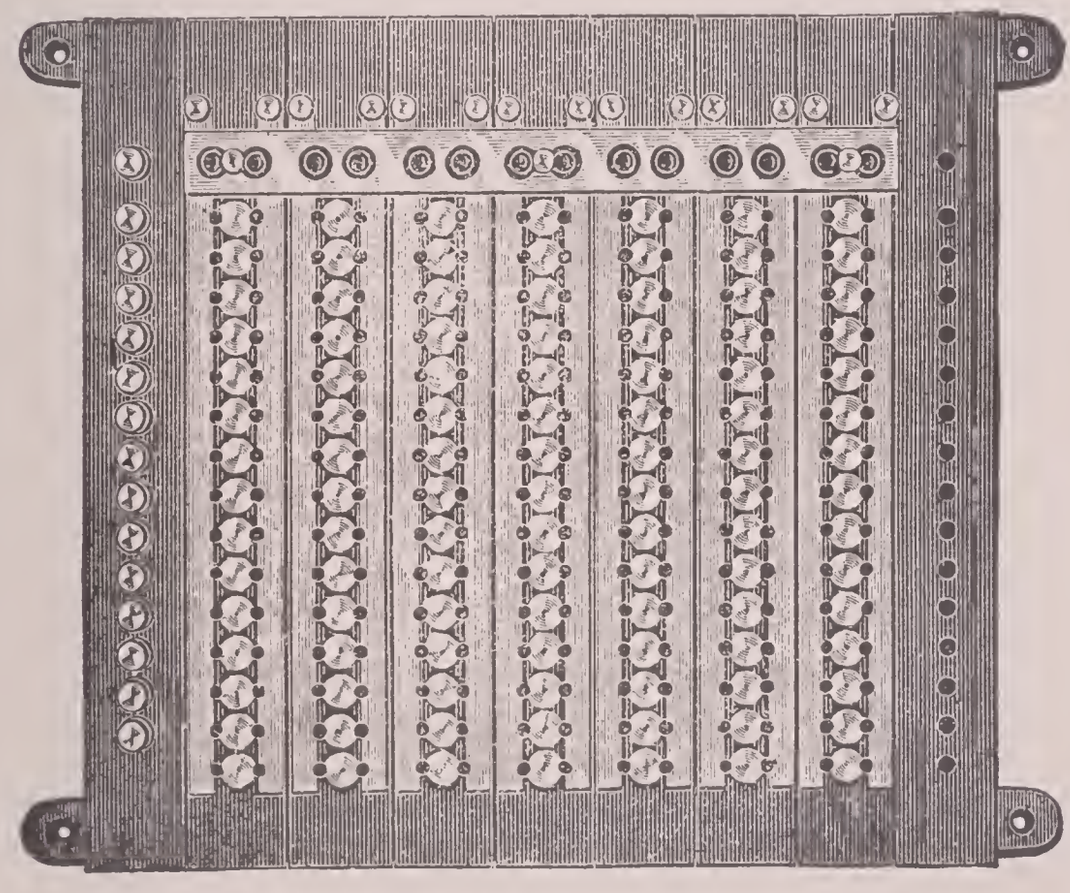


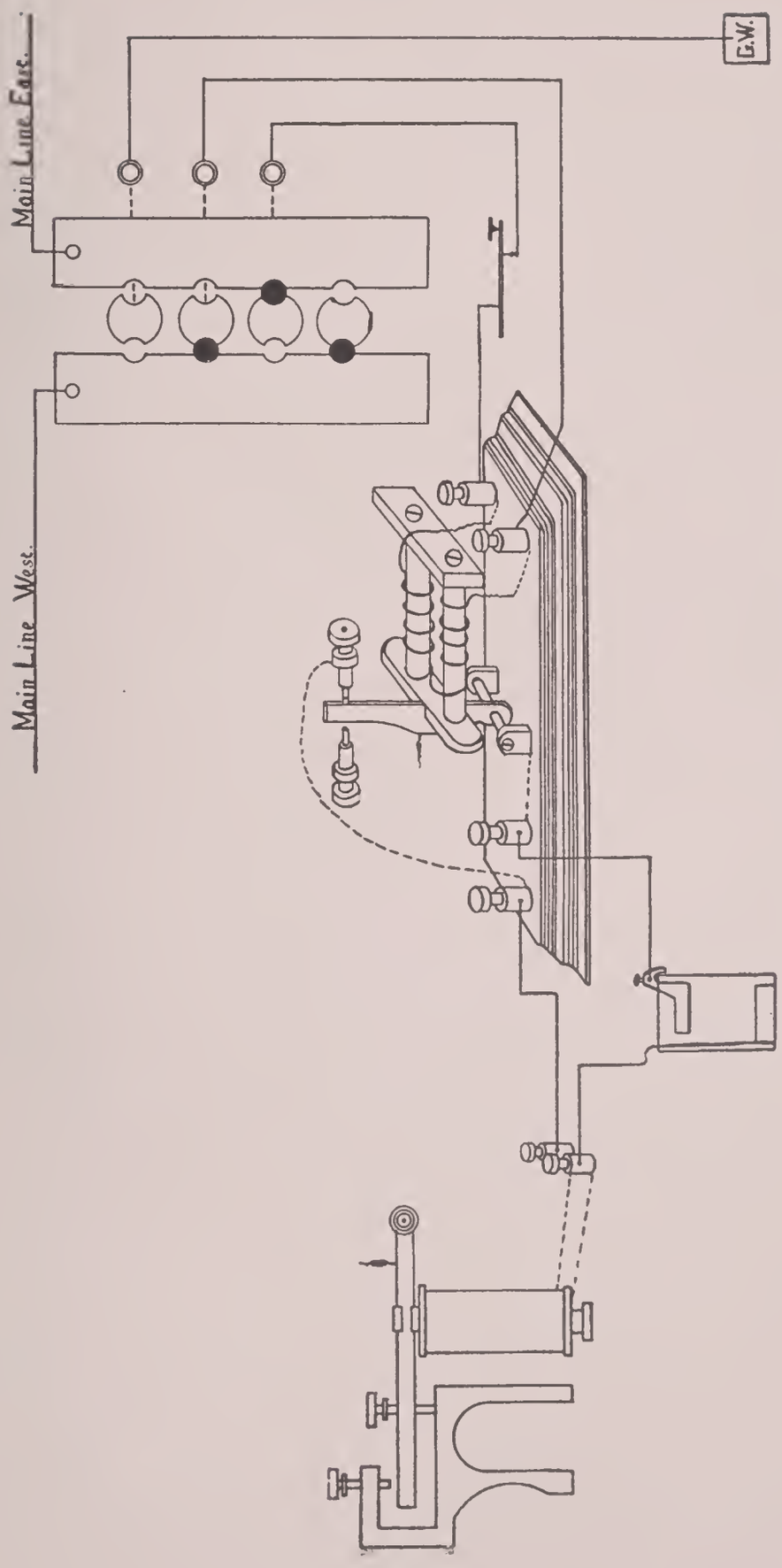
Fig. 7.

switch-board for intermediate offices are two perpendicular bars for each wire. If a wire which runs past our office is to be connected to our switch-board we cut it and bring each end into the office, therefore the need of the two bars for each end of the wire; at the top of these bars are binding posts to receive the ends of the main line wires. Between these bars is a row of discs

which are connected horizontally with each other on the rear of the board by a metallic strap with the exception of the bottom row, each horizontal strap is connected also with a binding post to which is connected the instrument wires. Each disc and each perpendicular bar has a semi-circular hole in its edge so that a metallic plug may be inserted which will connect the perpendicular bar and the horizontal strap on the rear of the board. The ground wire is connected with the top row of discs, which are covered by a metallic plate known as the lightning arrester. The lightning arrester and the perpendicular bars have no connection, space enough is allowed for a sheet of writing paper to play freely between them.

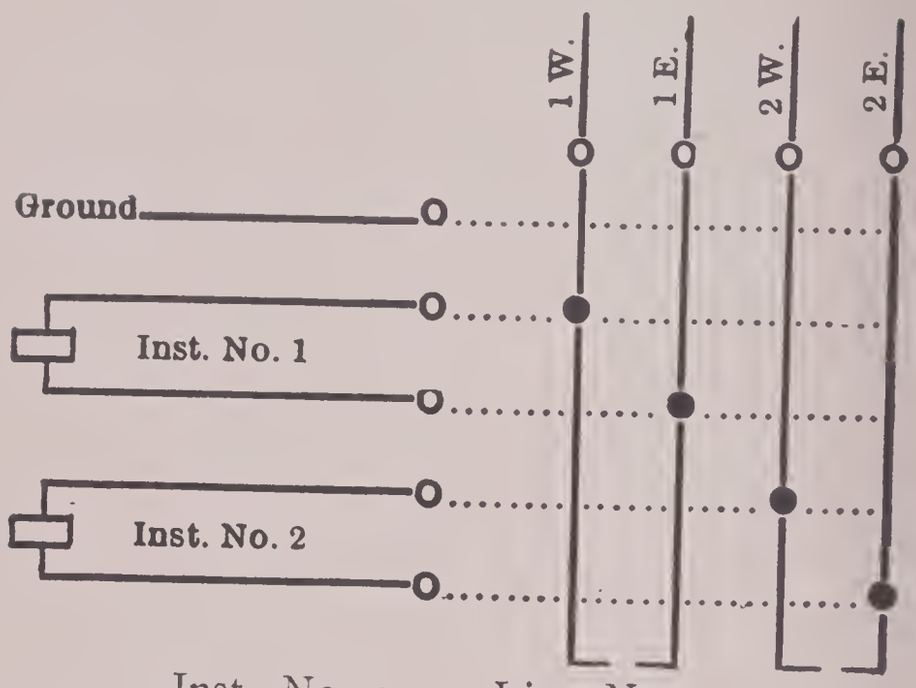
GROUND WIRE.

Every office is supplied with a ground wire which consists of a wire attached to a rod driven several feet in the ground, or to a gas or water pipe, the two latter being preferable. The rod of iron should be filed or scraped bright and clean for several inches, and insulated copper wire spliced to five or six feet of bare copper wire wrapped evenly around the brightened part of the rod, then tightly secured and soldered. Only the terminal ground wires are in use upon a line; their use at the intermediate offices is only for testing purposes and in case of interruption of the line to notify the testing operator and receive his instructions. The intermediate stations upon inserting a ground wire divide it into two independent circuits; there must be a main line battery at each terminus in order that the two circuits may work on either side of it.

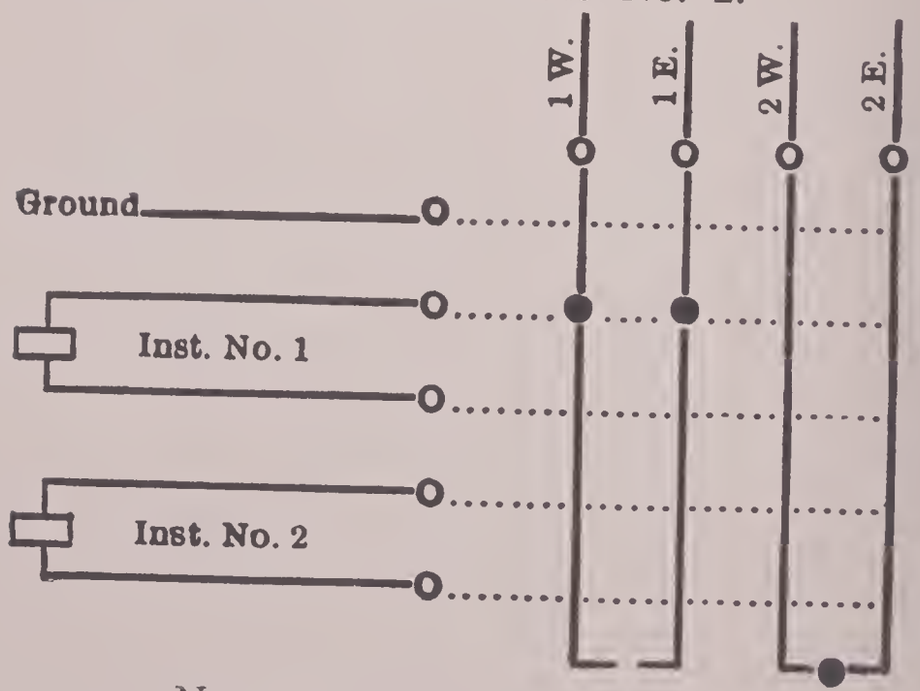


Ground Wire Diagram.

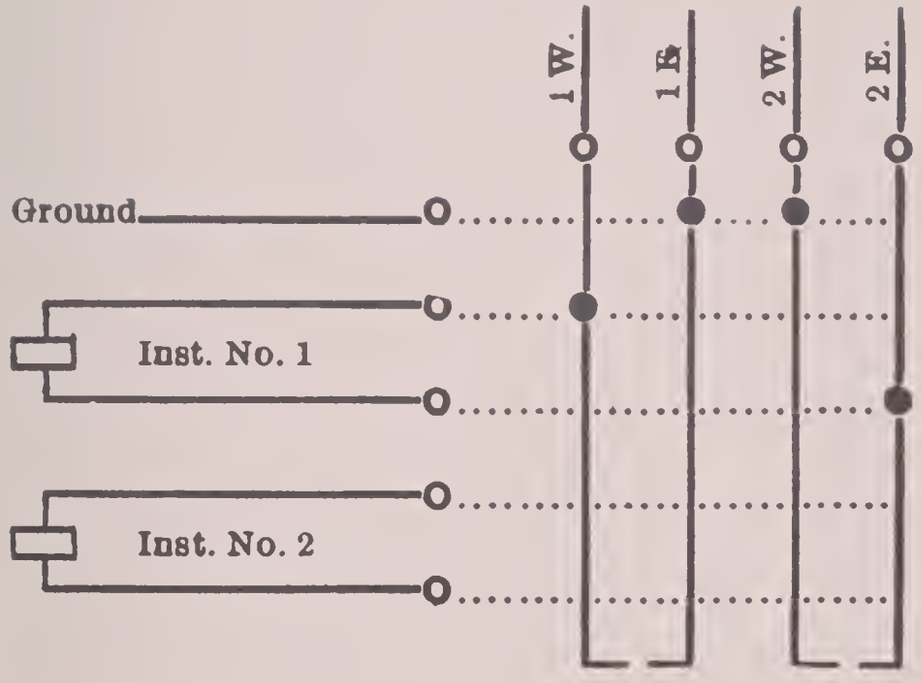
SWITCH-BOARD CONNECTIONS.



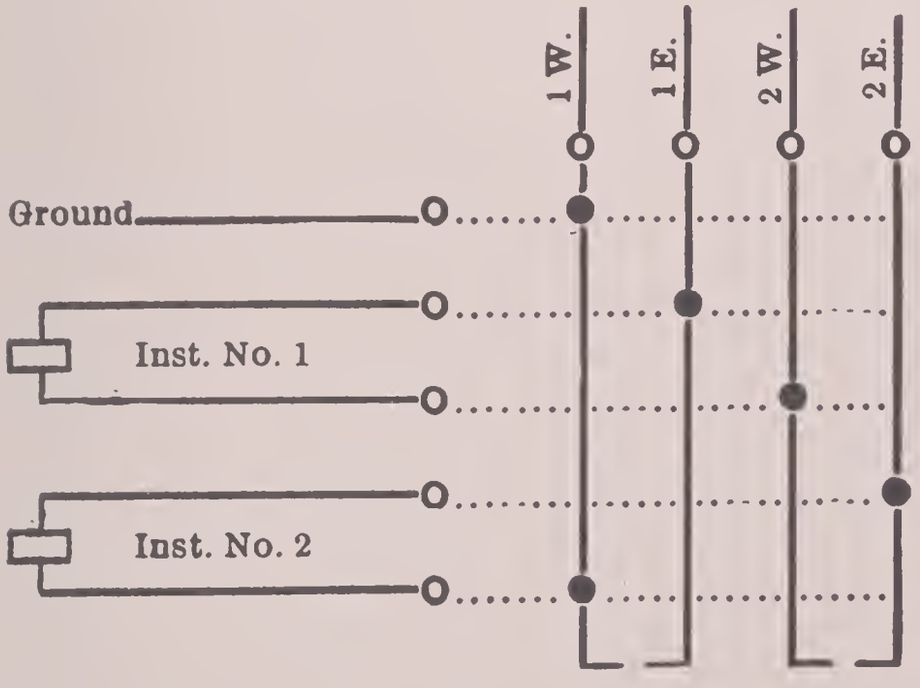
Inst. No. 1 on Line No. 1.
Inst. No. 2 on Line No. 2.



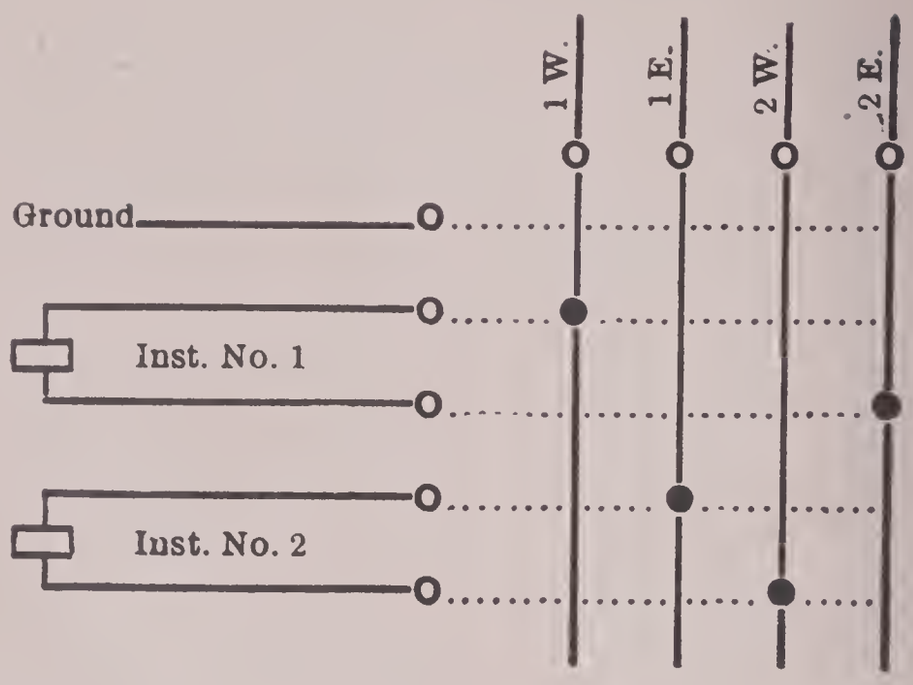
No. 1 cut out with inst. pins.
No. 2 cut out at the bottom.



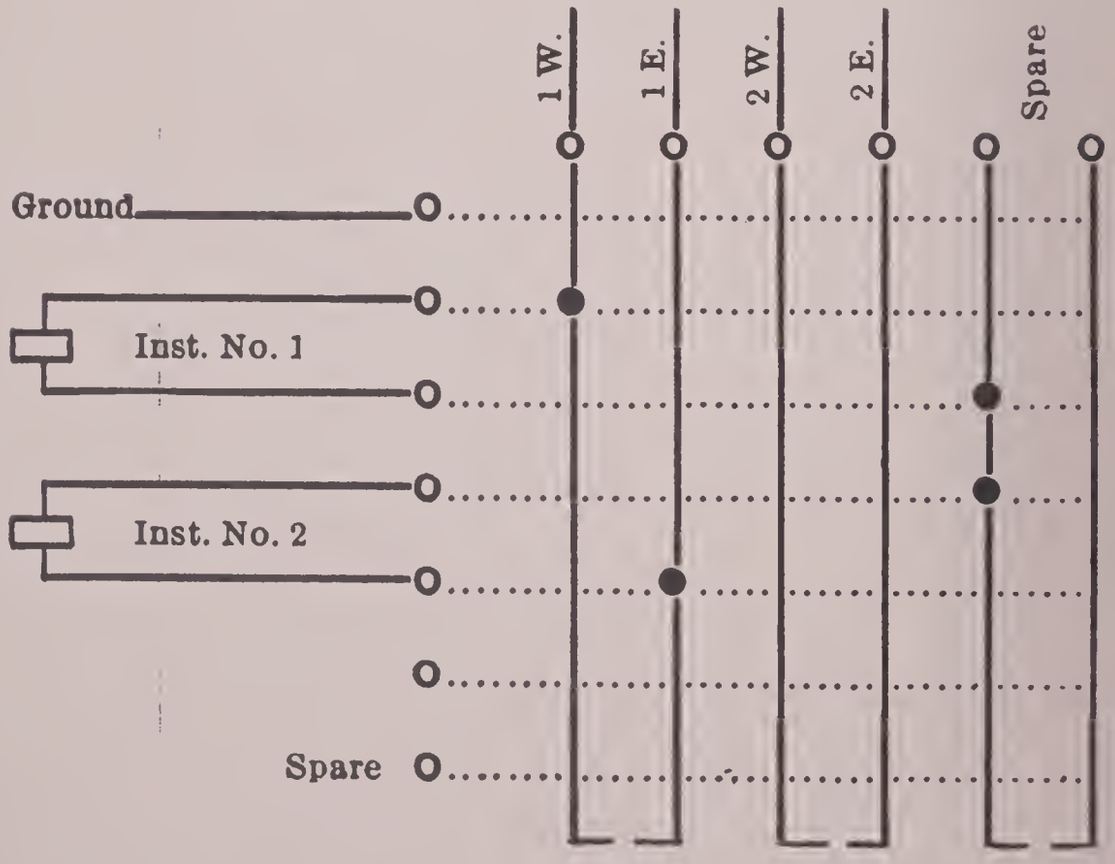
Inst. No. 1 on No. 1 W. to No. 2 E.
Ground on No. 1 E. and No. 2 W.



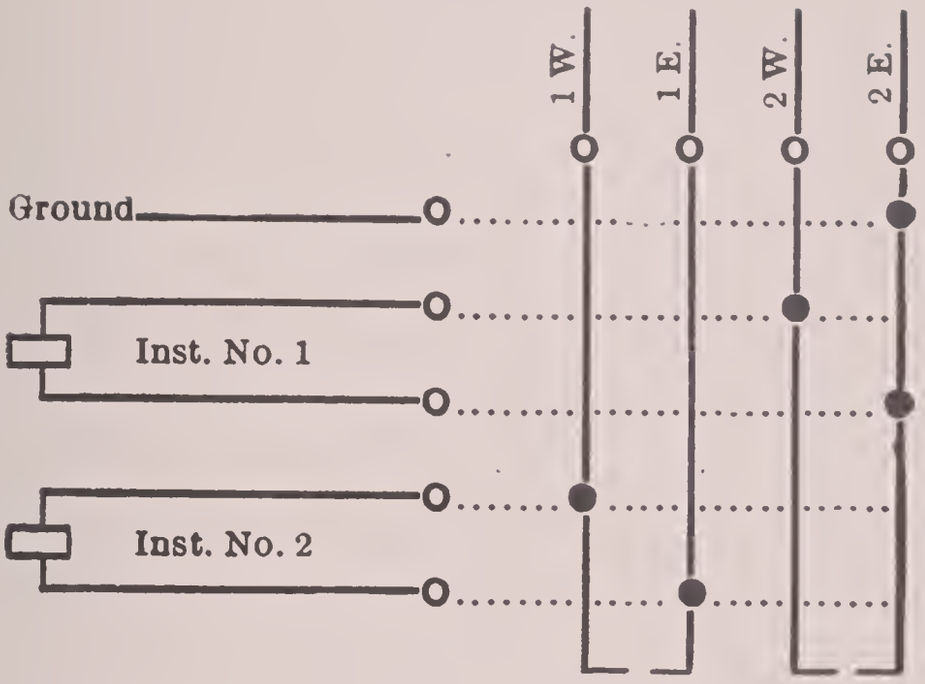
Inst No. 1 on No. 1 E. to No. 2 W., Ground on No. 1 W.
Inst No. 2 on No. 2 E. to Ground.



No. 1 W. to No. 2 E., No. 1 E. to No. 2 W. Insts. on both circuits.



Both Insts. on Line No. 1. No. 2 open at the bottom.



Inst. No. 1 on Line No. 2, Ground on No. 2 E.
Inst No. 2 on Line No. 1.

Study the preceding diagrams carefully and thoroughly understand them and you will have no trouble with the ordinary station board.

GENERAL INSTRUCTIONS FOR CIRCUIT.

Contention for circuit is strictly forbidden by all railway and telegraph companies.

Each office has a call consisting of not more than two letters, and in calling an office, call continually and sign your own office call after every third call. In answering your office call, say I I and your office call. Example of CH calling BN: BN BN BN CH BN BN BN CH. Example of BN answering call: I I BN. When asked to sign always give your office call.

Each operator will have a personal sign which may consist of one or two letters. Whenever you are asked "wo" always give your PERSONAL SIGN.

Upon hearing the call "OS" sent continually over the wire you will answer, giving your office call; it will usually be a message addressed to all Agents, all Operators or some particular class of employes.

If you are receiving at the wire and your instrument fails to work properly you should ask the sending operator to "dot," which he will continue to do until you get adjusted, when you will break in and say "OK" and give the last word received.

If your instrument which is connected with a wire remains quiet for any great length of time, never open your key without first turning your relay adjusting spring high enough to break the local circuit in order to make sure no one else is working your line. If the circuit is found open apply the ground wire to ascertain in which direction from your office the trouble lies, if after careful adjustment no circuit be found, cut in the instrument on another line which is known to be working and if it also opens that line it would indicate the trouble was in your instrument and it should not be cut in on any line until repaired.

If it be found necessary when working on a wire to leave the circuit open for a moment, it is necessary that you make explanation of the matter; if to answer the telephone, say, "ex me fone," if to deliver orders say "ex me trn." The circuit should never be left open longer than a minute in cases of this kind. If you are busy on another wire, or otherwise, and for any reason you cannot answer a call which is given you, you should, if possible, take the time to answer the office

by giving the signal "25" and your office call; it is necessary that you first find out what office is calling you, in order that when you get time you may call it and find out what was wanted, using the signal "5" and your office call.

Whenever you are repeating a message or a train-order and you are told by the sender that a word is an error, you should first open your key, then change your copy and repeat the copy as corrected. If for any reason when you have copied a message you wish to read it over and count the check before giving the OK, you should first open your key and keep it open until you are satisfied it is correct so no one will think you are through and take the circuit from you.

Whenever you are receiving a message and are interrupted by someone breaking in on you who is inclined to be meddlesome or is not adjusted, take the circuit and say "tts nt me" or "tts nt hr ga," adding the last word received; if the trouble continues the sender should make the signal "8" until he believes the person interrupting is adjusted or knows that he is "breaking" someone.

If you are in doubt whether the receiving operator is copying what is being sent him, at the conclusion of some sentence say, "bk u tr?" or "u tr?" If he is receiving what you are sending he will answer by saying "I" and sometimes adding his office call.

In taking the circuit from others you should do so as far as possible between their messages; this will avoid much confusion and error. Offices using the wire when interrupted have the next right to the circuit.

WIRE SIGNALS USED IN TAKING THE CIRCUIT FROM OTHERS.

The word "wire" is used by the wire chief or by operators when given permission by the wire chief or lineman for locating wire trouble, and has preference over all other business on any circuit. The signal "grn" and "stx" may be used for speculative messages. The signal "corn" may be used to make a correction in any message which has already been sent out. The signal "govt" may be used for sending government messages which pertain strictly to the official business of the government. The signal "cable" will be used for sending messages. The last five signals have preference over all other business on any circuit, exclusive of train-orders.

NUMERAL WIRE SIGNALS.

There are a few simple sentences which are used so often that figures have been substituted for them and they are used to abbreviate and save time. Some impart special information, while others serve to furnish an answer. There is a difference to some extent in their meaning on different lines, but the following are more or less in common use.

1. Wait a minute.
2. Very important.
3. Train reports.
4. Where shall I go ahead?
5. Have you any business for me?
7. Are you ready for business?

8. Close your key; you are breaking.

9. To clear the line for orders and for operators to ask for orders.

12. Do you understand?

13. I, or we, understand.

18. What is the trouble?

19. Train-order.

23. Accident or death message.

25. Busy on another wire.

29. Train dispatcher. Train-orders.

30. The end.

31. Train-order.

33. Answer paid for.

34. Message for all offices.

55. Important business.

73. Accept my compliments.

92. Deliver quick.

134. Who is at the key?

ABBREVIATIONS.

Abbreviations are used chiefly for wire conversation and are generally made by leaving out the vowels. Some are entirely arbitrary, while others are spelled simply by sound. One should not use too many of the arbitrary ones together. The following list will be found quite complete, the student should commit them to memory and practice them upon the wire as soon as possible, as they are very important and no good operator can afford to be without them. The conversation on railroads especially is nearly all abbreviated.

A.

abandoned, abnded
about, abt
abbreviations, abbn
acknowledge, "x" (used in train orders only.)
account, acct
action, actn
address, ads
afternoon, P. M.
agent, agt
all right, art
always, alwas
amount, amt
and others, "et al"
annulled, annld
another, ahr (or) anr
answer, ans
any, ay
anything, aytng (or) 5
April, Apl (or) Apr
are, r
arrive (or) arrived, "a"
ascertain, ascrtn
assist (or) assistant, asst
Assistant General Freight Agent, A G F A
Assistant General Passenger Agent, A G P A
attention, attn
attorney, atty
August, Aug
Avenue, ave

B.

"B" Block (used in block system only)
back, bk
baggage, bage
barrel, brl (or) bbl
battery, baty
be, b
become (or) became, becm
been, bn
before, b4
better, btr
between, betwn
bill-lading, "BL"
black, blk
blanks, blnx
block, blk
board, bd
body, bdy
book, bk (or) buk
bought, bot
boulevard, blvd
bound, bnd
break, brk
brakeman, brkmn
building, bldg
bushel, bu
business, biz
but, bt
by, bi

C.

can, cn
cancel former order, C F O
cannot, cnt
cashier, cashr
cent, ct
charge, chg
check, ck
chief, chf
circuit, ckt
clear, clr
coal and water, C & W
collect, coll
collect on delivery, C O D
combination, combn
come (or) came, cm
coming, cmg
commercial, coml
Commercial News Department, C N D
commission, comsn
company, co
complete, comp (or) "cm"
compliments, 73
conductor, condr
conductor and engineer, C & E
connection, conctn
copy, cy
correct, O. K.
correction, "corn" (used only as a wire signal.)
cost, insurance and freight, "c if"
could, cld
creditor, cr
crossing, xng

D.

day, da
day press rate, d p r
dead head, D H
debtor, dr
December, Dec
decrease, dec
democrat, dem
deliver, 92
delivery, dely
delivery charges guaranteed, dely chgs gtd
difference, dif
dinner, dinr
disregard former service, D F S
district, dist
division, div (or) divn
don't, dnt

depart (or) departed, "d"
Dispatcher, despr
destroy, bust
did, dd
double deck, DD
doubt, dbt
down, dwn
dozen, doz
draft, dft
duplicate, dup

E.

east, e
election, electn
empty, em (or) mt
engine, eng
engineer, engr
enough, enuf
errors excepted, ee
errors and omissions excepted, "e & o e"
every, evy
excursion, excn
excuse, ex
express, ex
extra, exa (or) xtra

F.

favor, fvr
February, Feb
few, fu
for, r
foreign, forgn
forward, fwd
free on board, F O B
freight, frt
from, fm (or) fr
foreman, 4 man

G.

General Baggage Agent, G B A
General Freight Agent, G F A
General Passenger Agent, G P A
get, gt
give better address, G B A
give some address, G S A
go ahead, G A
go ahead arrival, G A A
go ahead departure, G A D

going, gg
gone, gn
good, gd
good afternoon, P M
good evening, G E
good morning, G M
good night, G N
gossip, "guff"
got, gt
government, govt
grain, grn
great, grt
ground, gnd
ground wire, g w
guaranteed, gtd
guess, gs

H.

half, hf
has, hs
have, hv
hear (or) here, hr
high, hi
how, hw
hogshead, H H D
how is, hws
hundred, hnd
hundred weight, cwt

I.

immediately, immy
important, impt (or) 55
increase, inc
instrument, instmnt
invoice, inv

J.

January, Jan
junction, jct (or) junc
junior, jr

K.

knew, nu
know, no
knows, nos

L.

last month, ult
laugh, ha ha
learn, lrn
leave, lv
letter, ltr
light, lite
loads, lds
local, loc
look, luk
loop, lup
low, lo
limited, ltd

M.

made, md
main, mn
majority, maj
make, mk
manager, mgr
manifold, mfld
manifest, mfst
manufacturer, mfr
manufacturing, mfg
many, mny
March, Mar
marked, mkd
market, mkt
matter, mtr
May, Ma
merchandise, mdse
message, msg
messenger, msgr
might, mite
mile, mi
(mill) typewriter
million, mln (or) myn
minute, min
mistake, msk (or) bull
mistaken, mskn
Misses, Mrs
Mister, Mr
months, mos
more, mo (or) mr
morning, mng (or) A M
much, mch

N.

namely, viz
near, nr
necessary, necy
never, nvr
new, nu
next month, prox

night, nite—(red)
night press rate, n p r
none between, n b
north, n
not, nt
nothing, ntg
November, Nov
now, nw
no more, nm
no such number, N S N
number, no

O.

obedient, obt
obtain, obtn
o'clock, k
October, Oct
of, o
office, ofs
one hundred, 1 hnd
one thousand, 1 tnd
O K, correct
on time, ot
opening, opg
operator, opr
opinion, opn
order, ord
O S, All offices take notice .
other, otr
our, r
"out" (of no account)
out, ot
owners risk, "O R"

P.

package, pkg
paid, pd
pair, pr
passenger, pasgr
pay, pa
payment, payt
people, peo
pecks, pks
pink, (rush)
pint, pt
please, pls
pounds, lb
Post Office, P O
precinct, prct
preferred, pfd
present month, inst
president, prest (or) pt
principal, prin
prohibition, pro

Q.

quick, qk

quotation, qtn (or) tick

R.

railroad, R R
railway, Ry
ready, rdy
rebate, reb
receipts, rects
received, recd
receiving, recg
red, (nite)
refrigerator, refr
release, "rel"
relay, rela

relief, rj
repeat, rept
report, rept
report delivery charges, rept dely chgs
republican, repn
right, rite
roast, (a great number)
round, rnd
rush, (pink)

S.

said, sd
same, sm
say, sa
second, sec
section, secn
see, c
see former order, S F O
see former service, S F S
seen, cn
see your service, S Y S
single deck, S D
sir, sr
slow, slo

some how, smhw
some one, sm 1
something, smtng
somewhat, smwt
somewhere, smwr
soon, sun
south, s
speak, spk
special, spl
special delivery guaranteed, spl dely gtd
sending, sendg
September, Sept

service, svc
several, svl
should, shld
siding, sdg
sight, site
sign, sine
signature, sig
signed, sined (or) sgd
station, stn (or) sta
stay, sta
stock, stx (or) stk
stop for breakfast, sfb
stop for dinner, sfd
stop for night, sfn
stop for tea, sft
straight, strate
street, st
superintendent, supt
supper, supr
suppose, spose
switch, sw
system, sys

T.

take, tk
talk, tlk
tariff, tf
telegraph, tel
telephone, fone (or) phone
thanks, tnx
that, tt
that is, tts (or) "i. e."
the, t
their, tr
them, em
then, tn
there, tr
they, ty
thing, tng
think, tnk
this, ts
this morning, tsmng (or) ts A M
though, tho
thought, thot
thousand, tnd
through, thru (or) tru
tierce, tc
to-day, toda
together, togtr
tomorrow, tomw
tonight, tonite
took, tuk
tough, tuf
track, trk
train, trn
transfer, tfr
Traveling Passenger Agt., T P A
trouble, tbl
try, tri
typewriter, (mill)

U.

unchanged, unchgd
undelivered, undeld

understand, 13

V.

versus, "vs"

very, vy

W.

was, ws
water, wtr
way, wa
way bill, "W B"
weather, wtr
west, w
wharf, whf
what, wt (or) ?
when, wn
where, wr
while, wile

why, wi
who, wo
will, wi
with, wi
word, wd (or) w
worked, wkd
would, wld
write, rite
wrote, rote
wrong, wng

X.

"X" acknowledge (used in train orders only.)

Y.

yard, yd
yards, yds
yes, es
year, yr
years, yrs
yesterday, estrda

yet, et
you, u
young, ung
your, ur
yes sir, esr

GENERAL RULES AND INSTRUCTIONS FOR TELEGRAPH EMPLOYES.

The telegraph department is under the management of the Superintendent of Telegraph, who will have charge of the telegraph service and other electrical business of the company, including construction and maintenance. The appointment of telegraph operators will be made by the Chief Train Dispatcher of each division, in his capacity of chief operator. Such appointment must be approved by the Division Superintendent.

The Superintendent of Telegraph will report to and receive his instructions from the General Superintendent.

CHIEF OPERATOR.

Chief dispatchers acting as chief operators will be intrusted with the ordinary working of the line, testing and changing of circuits, and the direction of operators and repairers in the discharge of their duties. They will report to the Superintendent of Telegraph daily, the state of the weather and the condition of the circuits under their charge, the nature and location of interruptions to the circuits that have existed, or do exist, and what measures have been taken for repairs. They will also report when lines previously reported as in trouble are repaired.

Chief Operators will report any neglect on the part of operators or repairers that may come under their notice, and will at all times manifest an interest in the successful operation of the wires. and will co-operate.

with the Superintendent of Telegraph in securing good working lines.

The night train dispatchers will have charge of the wires on their respective divisions between the hours of 7:00 P. M. and 7:00 A. M. and will assume the duties of the chief operator during that time.

OPERATORS.

Telegraph operators report to and receive instructions pertaining to the business of the railway from the Division Superintendent or Train Master, and pertaining to the business of the Telegraph Department from the Superintendent of Telegraph, and will obey the instructions of the Chief Train Dispatcher of the division.

They are required to be constantly on duty during the hours assigned to them, and must not leave their offices without permission from the Train Dispatcher on duty.

Office hours for operators at stations where there are no night offices are from 7:00 A. M. until relieved by the train dispatcher on duty. Office hours for operators at stations where there are night offices, day operators, from 7:00 A. M. until 7:00 P. M. Operators at such stations are required to come on duty promptly at the regular hour, and remain on duty until relieved by their colleague, or excused by the Train Dispatcher. At offices where more than one day or night operator are employed, there must be one person on duty at all hours. Day operators must keep the location of their residence posted up inside bill boxes, at stations where there are no night offices, so that trainmen may know where they are to be found.

Operators must not go beyond hearing of their call, nor leave the office without first notifying the Train Dispatcher and obtaining his permission.

Operators will assist and obey the instructions of the station agent, when it does not interfere with their duties as operators.

There must be no delay in obtaining answers to telegrams. If a reply cannot be had in reasonable time, the sending office must be promptly notified of the reason.

It will be the duty of the agent and operators to see that the train-order signals are kept in good working order and ready for use at all times, and when necessary oil them, using kerosene oil to make them work freely. Should the signal become disabled and out of order, and repairs needed, prompt notice must be sent to the train dispatcher by wire, giving cause of trouble, and stating what material is required for repairs.

Operators are expected to make suggestions and give such information from time to time, as is calculated to improve the service. Should anything occur which does, or is likely to impair the service in any way, it must be reported at once to the Superintendent of Telegraph. Operators will familiarize themselves with the Western Union Book of Rules and obey them.

Operators are required to devote themselves exclusively to the service of the company during business hours; those having other duties to perform in the freight department will not allow such duties to prevent proper attention being given to the telegraph. At offices where there is but one day and night operator, the day operator acts as agent or manager, and is held responsible for all cash taken in.

Operators are required to be in their offices when

trains are due or at their stations and not out on the platform unless the service requires their presence there; they will keep a register of all trains passing their station and the reports from such station as the Train Dispatcher may require and report the same promptly to the Dispatcher.

They must give public notice upon the bulletin board of the time trains carrying passengers are due, and whether on time or how much late.

All instruments necessary for the use of the telegraph department at each office will be furnished by the Company, which, together with the office furniture and fixtures, must be kept clean and in good order. No private instruments will be allowed upon the wires, and no private lines must be connected with any office without the permission of the Superintendent of Telegraph.

Always try to be accommodating, treating all persons with respect, with whom you come in contact. Do not get out of patience if traveling men make what might seem unreasonable requests, or ask a small favor. Be ready at all times to aid feeble or old persons on and off trains, and make yourself of worth to the Company and your services will be rewarded. Remember a good word spoken of you from the traveling public will soon reach the officials and greatly figure in your chances for promotion.

Do not depend upon any one to do your work for you; or meddle with other employees' business unless your help be requested.

In case of accident, no account or message respecting it, other than regular tariff business, must be sent unless to an officer of the Company, signed by an agent, conductor or other authorized person, nor must it be

made the subject of conversation or remark over the wire or otherwise. Particulars for the public, or for publication will be furnished only by an officer of the Company, or upon his authority.

Contention for circuit will not be permitted. Any operator who follows this practice will be promptly dismissed. In case of doubt, or when unable to "raise" an office within a reasonable length of time, operators must promptly call upon the Chief Operator or Superintendent of Telegraph for assistance.

Operators must make themselves familiar with their switch-board and cut-outs, so they can connect wires as directed by the testing operator. Always be sure that the testing operator has finished his directions before commencing to connect wires, or to remove ground wire. When directed to cross-connect, open, close or ground a wire, follow directions carefully. When they have been carried out say "now" and always keep an instrument on the wire on which instructions are being given, until communication is restored. Never connect wires vice versa unless directed to do so. Operators must invariably sign their office call when using the line for any purpose whatever.

They will block all trains the required time apart, as provided in the rules, unless otherwise directed, and must keep a full set of signals in good order, and always ready for immediate use, and use them strictly in accordance with the rules and observe the rear of trains and report at once to the Superintendent or Train Master if markers or red lights are not displayed as provided by the rules.

When fixed signals become soiled or faded, operators will report their condition to the Superintendent or Train Master.

Operators using positive block must not give a train that is blocked a clearance card unless they are positively sure that the train can proceed.

The day operator will be held responsible for the working condition of the train order signal.

Operators will report the state of the weather in cases of rain, snow, fog or severe storm in their vicinity, day or night, to the Train Dispatcher.

Where two or more operators are employed, one must always be on duty. Operators going off duty must notify relieving operators of any undelivered orders, relieving operators receipting for them on the face of orders; also notifying relieving operator of any unfinished business.

Operators must not leave their offices before the arrival of an expected train that is due, without permission of the Train Dispatcher.

They must not leave their office while a train is at the station, unless required by business connected with the train.

When they are given leave of absence they must, before leaving, see that their substitutes are thoroughly acquainted with the duties of the office, the management of the switch-board, instruments, batteries, etc.

Before opening a key they must adjust the relay, using special care in wet weather, to make sure that the circuit is not in use.

They must in transmitting, write firmly, space carefully and take every precaution to guard against mistakes.

They must use good judgment in working with inexperienced operators, and must regulate their speed of transmission to suit the capacity of the receiving operator,

to avoid breaking, or possibly an error, and the consequent loss of time.

They must not receive messages to be transmitted free, unless such message pertain to the business of the Company, and are signed by an officer, agent, or employe, except answers to such messages.

They must promptly deliver messages received, consider all messages confidential, and not permit them to be read by any person except those to whom they are addressed, nor make their contents the subject of conversation or remark.

All messages not relating to the business of the Company must be paid for, unless otherwise ordered by the proper authority.

They must record in the proper place upon the face of each message received and sent, the time, date, month and year, and the initials of the operator who received and sent it.

No alterations, additions or erasures will be allowed on original messages after transmission, and they will be retained in the files, unless they are called for by the Superintendent or general officer or by Superintendent of Telegraph. If originals are called for, a copy must be left in the files, with a memorandum attached showing the disposition of the original. Railroad messages, after being transmitted, must be carefully filed daily, and preserved for one year, unless otherwise directed.

All telegrams received for delivery to an officer of the company, who may be en route upon the road, must be enclosed in a proper envelope and sealed, and addressed to him before delivery.

Operators should require persons leaving messages at their offices for transmission to read them aloud before they are accepted.

They must exhibit a courteous disposition at all times, in and about their offices, and over the wire, avoiding unnecessary conversation; be polite to all and prompt in furnishing proper information to those entitled to it. The use of profane, obscene or ungentlemanly language over the wires, or in and about the company's offices, is positively prohibited.

Students must not be allowed to enter or practice in an office without first obtaining permission from the Superintendent of Telegraph. The attention of students must be called to all rules of the company, and particularly to those relating to the privacy of telegrams.

The regular operators will be held responsible for any interruptions that may occur to the line, or delay to business, caused by incompetent or unauthorized persons using the instruments.

THE DOUBLE ORDER SYSTEM.

In the double order system the Dispatcher calls up all offices where orders can soonest be delivered to the train concerned, and sends the order to each at one transmission; the order being worded so that it serves for both trains. This system is considered the most reliable and less liable to error.

Note—Among the points in its favor might be stated that the mental strain upon the Dispatcher arising in the single order system where he has to keep several different orders in his mind at the same time, lest he gives different meeting points to different trains, thereby causing wrecks, is entirely absent in the double order system. In preparing this order the Dispatcher cannot possibly give different meeting points, as there is but one message

to each train and being sent to both at one sending, each must get the same as the other.

Thus we have several addresses; one for each train concerned, and are transmitted in their respective order.

GENERAL INSTRUCTIONS IN TRAIN ORDER WIRE WORK.

Trains are addressed in train orders as follows: "Let HB" be the office call for Hannibal. In addressing an order to 2nd. No. 62 at Hannibal, the following form is used: "To HB C & E 2nd No. 62." For different trains at different stations, substitution is made for the different station office calls in the place of "HB" and the different trains in the place of "2nd. No. 62."

Train orders are numbered in transmitting in succession each day, No. 1 commencing at midnight.

ORDER OF TRANSMISSION.

Order No.....
Trains addressed to at each station.
Period.
Body.
Signature.

Example of a simple train order as sent on the wire. Letters in the parenthesis () are sent, but not copied by the receiving operator.

(31 copy 3) Order No. 1.
(to) HB C & E No. 55
(to) I C & E No. 6 (.)
No 55 Eng 286 and No 6 Eng 13 will meet at Callao instead of Shelbina. (sig) F. W. H.

ACKNOWLEDGMENT OF RECEIPT OF TRAIN ORDERS.

When it is desirable to have the train of inferior right receive its orders and act upon them before the order is completed and delivered to the train of superior right, it is necessary for the dispatcher to receive an acknowledgment (from the operator who has the orders for the train of superior rights) that he will hold the superior train until they get the order before he can allow the train of inferior right to proceed. Example:

No 65		No 66
A.	B.	C.

Let us suppose that No. 65, the inferior train, is now waiting at station "A" and that No. 66, the superior train, has not yet arrived at station "C," and they are to meet at station "B." Now, if the Dispatcher is sure that No. 65, the inferior train, will get a copy of the order, he can allow operator at station "A" to repeat and complete his order first and No. 65 could leave station "A" and proceed to the meeting point, which in case No. 65 was a heavy train, would greatly lessen the cause of delaying No. 66 at the meeting point.

Thus for acknowledging receipt of a train order and assuring the Dispatcher the train addressed will be held until a copy is delivered the form of X ing is used as an abbreviated form.

ORDER OF "X ING."

Form and order No.....
Your office call.
Train addressed at your station.

The letter "X."
Your personal sign.
Example of "Chillicothe" or "HI" office "X ing" Order No. 1. "31 No 1 HI C & E No. 6 X GO."

ORDER OF REPEATING.

Form and order No.....
Your office call.
Train addressed at your station.
The letter "X."
Your personal sign.
Period.
Body of the order.
Conductor's signature and his train number.
Example of "Hannibal" or "HB" office repeating Order No. 1. "31 No 1 HB C & E No 55 X SN (.) No 55 Eng 286 and No 6 Eng 13 will meet at Callao instead of Shelbina."

Sig. Johnson condr trn No 55.

HOW TO COPY ORDERS ON THE FORMS.

Let us next make a careful study of the two following forms which are adopted as the standard for copying train orders. On the first "form 31," let us suppose that Hannibal office is going to copy and using "HB" for his office call, "SN" for his personal sign. On the second "form 19," suppose that Chillicothe is going to copy and use "HL" for his office call, "Go" for his personal sign. The Dispatcher after calling "HB" and receiving his reply, would say, "31 copy 3," meaning "make three copies on form 31;" then after raising "HI" would say, "19 copy 3," meaning "make three copies on form 19." Then

he would start out with Order No. ....., stating the number which we will suppose was 10; both operators would then put the number 10 on the blank space opposite the Order No. ..... The Dispatcher would then address "HB" and give his train address as follows: To HB C & E Exa 427 West. The operator at "HB" would then write after the word To ..... The train address, C & E Exa 427 West and his station name "Hannibal" after the word At..... The Dispatcher would then address "HI" and say, "To HI C & E 2nd No 46," and make a period, indicating that he was ready to begin the body of the order. Operator at "HI" would fill in the form the same as "HB," only it would read "To *C. & E. 2nd No* 46 *at Chillicothe.*" Commencing with the period, the Dispatcher would send the body as follows:

"Exa 427 West has right of track against 2nd No 46 Eng 928 Hannibal to Callao." Sig F. W. H.

Both operators would copy the body as sent in the space provided; at the conclusion of the dispatcher's initials "F. W. H.," the Dispatcher would address "HB" as follows: "To HBX." Operator at "HEB" would then take the wire and say, "31 No 10 HB C & C Exa 427 West X SN." The Dispatcher would then give him OK and the time as follows: "31 No 10 OK 7:51 PM F. W. H." Operator at "HB" would then write his initials and the time after the letter X.....Opr .....M. The Dispatcher after giving him OK, would address "HI" as follows: "To HI ga," Operator at "HI" would take the circuit and say, "19 No 10 HI C & E 2nd No 46 X GO," make a period and repeat the body, giving his own name as signature. The Dispatcher would then give him complete and the time as

follows: "19 No 10 OK & complete 7:55 P M F. W. H." "To HB ga." Operator at "HI" would write the word complete after word Made ..... and the time, 7:55 PM, after the word Time ..... and his name, Gregory, before the word.....Opr., and also fill in the spaces X..... Opr..... M., with his initials and the time. Operator at "HV" would then give the circuit as follows: "31 No 10," make a period and repeat the body, giving the conductor's name and signature. The Dispatcher would then give him complete as follows: "31 No 10 complete 7:58 PM F. W. H." Operator at "HB" would write the word Complete in the column headed "Made" and the time in the column headed "Time" and his name in the column headed "Operator." Each operator will fill in the blank places .....190..... without instructions from the Dispatcher.

It must be remembered that No. 31 order cannot be completed until the signature of the conductor, or person addressed, is signed to the order, and the same has been transmitted to the Dispatcher. Upon repeating back an order, if you have not yet the conductor's signature to send to the Dispatcher, you will only receive the OK response and the time, which time goes in the space provided— Repeated.....M. After you have received the conductor's signature to an order, which you have already repeated, you must then get the wire and repeat the same to the dispatcher in the following form: "31 Order No 10 sig Jones trn Exa 427 West." The Train Dispatcher will then give you complete as follows: "31 No 10 complete 7:58 PM. F. W. H."

MISSOURI CENTRAL ROUTE

FORM 19

TRAIN ORDER No. 10

Chicago, Ill., Aug 8th, 190 4

FORM 19

To C & E 2nd No 46

At Chillicothe STATION.

X GO Opr. 7:55 P M.

Exa 427 West has right of track against
2nd No 46 Eng 928 Hannibal to Callao.

F. W. H.

CONDUCTOR AND ENGINEMAN MUST BOTH HAVE A COPY OF THIS ORDER.

Made Complete *time* 7:55 P *M.* Gregory, *Opr.*

MISSOURI CENTRAL ROUTE

FORM 31

TRAIN ORDER No. 10

Chicago, Ill. Aug. 8. 1904.

FORM 31

To C & E Exa 427 West, | At Hannibal STATION.

X SN Opr. 7:51 P M.

Exa 427 West has right of track against
2nd No 46 Eng 928 Hannibal to Callao.

F. W. H.

CONDUCTOR AND ENGINEMAN MUST BOTH HAVE A COPY OF THIS ORDER.

Repeated at 7:58 P. *M.*

CONDUCTOR	TRAIN	MADE	TIME	OPERATOR
Jones	427 W	Complete	7:58 P. M.	Seaton

TRAIN ORDER WIRE WORK.

(As overheard on the wire from start to finish.)

Meaning of the abbreviations used in the following:

"HB"—Office call for Hannibal, "SN"—Operator's personal sign.

"HI"—Office call for Chillicothe. "GO"—Operator's personal sign.

'CU"—Dispatcher's office call. "F. W. H."—Dispatcher's initials.

"Hr—Here 29"—Train dispatcher, train orders. "31 and 19"—Forms of orders."

"Cy—Copy." "U—you." "&—and."

Example of what would be heard go over the wire in the "X" order system as used in the previous order:

(Dspr) Hr 29 HB HB HB 29 CU
(Opr HB) I I HB
(Dspr) 31 cy 3 u & HI 29 HI HI 29 CU HI
(Opr HI) I I HI
(Dspr) 19 cy 3 (.)
Order No 10
To HB C & E Exa 427 West
To HI C & E 2nd No 46 (.) (.)
Exa 427 West has right of track against 2nd No 46 Eng 928 Hannibal to Callao. Sig F. W. H.
To HB X CU
(Opr HB) 31 No 10 HB C & E Exa 427 West X SN
(Dispr) 31 No 10 OK 7:51 PM F. W. H. To HI ga
(Opr HI) 19 No 10 HI C & E 2nd No 46 X GO (.)
Exa 427 West has right of track against 2nd No 46 Eng 928 Hannibal to Callao. (.) Sig Gregory.
(Dspr) OK Hr msg CU FW

Fm Chicago 10
To condr 2nd No 46 (.)
Leave one large box for hay at Shelbina, and one spl stock car at Callao (.)
(Sig) F W H
19 No 10 complete 7:55 PM F. W. H. to HB ga (.)
(Opr HB) 31 No 10 (.)
Exa 427 West has right of track against 2nd No 46 Eng 928 Hannibal to Callao (.)
Sig Jones trn Exa 427 West
(Dspr) Hr Clip CU FW
Fr Chicago 10
To condr Exa 427 West (.)
Pick up 2 cars cattle at Palmyra Jct and take them through (.) Sig F. W. H.
31 No 10 complete 7:58 PM F. W. H. 29 CU HI HI 29 CU
(Opr HI) I I HI
(Dspr) OS
(Opr HI) OS OS HI 2nd No 46 by 801 HI
(Dspr) OK CU

BREAKING IN TRAIN ORDERS.

Breaking is to open the key and stop the sending operator when you miss a letter or word. In breaking in an order should you miss the order No, say "No"; in the address say, "To," ADDING YOUR OFFICE CALL; in the beginning of the body say, "period (.)"; in the body give the last word received; in the signature, say, "sig."

(For other forms of Train orders, see Standard Code as revised by the American Railway Association, in another portion of this book.)

RAILROAD TELEGRAMS.

Railroad telegrams or messages are those which are sent and revised between officials, agents and other employees of a railroad company, and pertain strictly to business of the company. They have no checks, and no record is made of them, are brief and concise as possible and usually composed of many abbreviations, are addressed and signed with full names, except when limited to one division, in which case initials are generally used.

Each message received must show on its face from which office it was sent, the signatures of both sending and receiving operators and the time received.

Telegrams addressed to persons on trains (except those addressed to train men) must be enclosed in sealed envelopes. The contents of all telegrams must be held strictly confidential.

GENERAL INSTRUCTIONS IN RAILWAY MESSAGE WIRE WORK.

The signals "Hr," "Anr," or "Ahr," are used to announce the beginning of a message, and to the operator seem as plain as for some one to say, "Here" or "Here is another," sometimes they say, "Hr msg" or "Hr clip"; any of the above terms mean get your message blank, here is a message for you. Following this will be sent the office call, of the sending office, then the personal sign of the sending operator; following his sign will come the signal "Fm" or "Fr," which announces that the place from which it is being sent and the date will follow; following the date the signal "To" announces that the address will follow; following the address the signal "period (.)" announces that the body will follow;

at the conclusion of the body the signal "sig," announces that the signature will follow. The above signals are sent by the sending operator, but never copied by the receiving operator.

ORDER OF TRANSMISSION.

Office call of sending office.
The sending operator's personal sign.
Place from and date.
Address of the message
Body.
Signature.

Example of how a Railway message is transmitted. The combination of letters enclosed in the parenthesis ( ) are sent by the sending operator, but not copied by the receiving operator.

(Hr msg) HB SN
(Fm) Hannibal 12
(To) Bloomdahl, Sect 4 man, HI (.)
Go to Shelbina and help raise track next week work 5 men. (Sig) J. B. D., R. M.

HOW TO COPY MESSAGES ON THE FORMS.

Let us now make a study of the following form which will be found similar to that used on most roads. Let Hannibal be the sending office, "HB" the office call, and "SN" the operator's personal sign. Let Chillicothe be the receiving office, "HI" the office call, and "GO" his personal sign. After calling "HI" and receiving his reply, "HB" would say, "Hr msg," meaning get your blank, I have a message for you; following this he would give his office call "HB," which the operator at "HI" would

place in the space under the words office call, next he would give his personal sign, "SN," which the operator at "HI" would place in the space under words Sent By, and under the words Received By, he would put his own personal sign, "GO," and the time received in the space under the word Time; then the operator at "HB" would say, "FM Hannibal 12," operator at "HI" would then write Hannibal 12 opposite the word From..... and also the year in the place provided 19....; then operator at "HB" would say, "To Agt HI,"; the operator at "HI" would place the abbreviation "Agt" after the word To ..... and his office call, "HI," after the word At ....., the operator at "HB" would then make a "Period (.)," which announces the beginning of the body of the message and send the body and signature as follows:

Pls advise how many psngrs for the excn tomorrow.
Sig. W. D. B.

The operator at "HI" would copy the body and signature on the blank space provided for that purpose, and would acknowledge receipt of the message by giving the signal OK, his personal sign and his office call as follows: OK GO HI. After receiving the OK and his personal sign, the operator at "HB" would time the message by placing on its face the receiving office call, the receiving operator's personal sign, his own personal sign and the time as follows: HI 1:32 PM SN GO.

In copying messages, you should always place your personal sign and the time received in the proper places at the same time you are receiving, then it will never be omitted. This will be found quite difficult at first, but by careful practice from the start it can soon be mastered,

MISSOURI CENTRAL ROUTE

MESSAGE.

ALL MESSAGES COPIED ON THIS BLANK MUST BE WRITTEN IN INK.

OFFICE CALL	SENT BY	RECEIVED BY	TIME
HB	SN	GO	1:32 PM.

From Hannibal 12 **19** 07.

To Agt **At** HI

Pls advise how many psngrs for the excn tomorrow.

W.D.B.

BREAKING IN RAILWAY MESSAGES.

When breaking in railway messages, should you miss the "office call" of the sending operator, say "sine"; the personal sign of the sending operator, say "wo"; the name of the place from which it was sent, say "fm"; in the date say "date"; in the name or initials of the address say "to"; in the beginning of the body say "period (.)"; in the body, give the last word received; in the signature, say "sig."

TELEGRAPH REPORT CALLED "THE SOUP TICKET"

Callao **Station** 8/16 **1907.**

Train No. Exa 927 East **Engine No.** 927

Arr. 3 10 A M. **Dep.** 3 28 A M.

LOADS **EMPTIES** **PASSENGER**

Stock 15 N.W. Mail and baggage

Time Freights 4 **Foreigns** 11 **Coaches**

D Freight 807 Tons **Sleepers**

Wilson **Conductor.**

The above report would be sent as follows:
(Hr soup tkt) CL AM "S" "4:08 PM."
(fm) Callao 16 (.)
Trn exa 927 East a 310 d 328 Lds 15 Time Frt 4 Mts Fgn 11 Total Tons 807. (sig) Wilson.

THE DETAIL TRAIN REPORT

To the Train Dispatcher:

Chillicothe 8/16 190 6

Train 116 **Left** 4:10 PM. **Engine** 896

Engineer L S Morgan **Conductor** King

LOADS.

Give contents and destination of each load and state when carded, or Time Freight. Give route of Eastern Time Freight.

No. lbs.	Contents	Destination	Time	Route	Tonnage
17	Sheep	Kansas City			450
11	Hogs	"			330
1	Horse	Omaha Stk Yd		U P Trns	30

EMPTIES.

Give initials, Kind of Cars, Destination, and Size of Local Box and Stocks.

No. Mts.	Initials	Kind	Destination	Size	Tonnage
4	C & N W	Box	Home		48

King **Cond'r or Agt.**

Detail train reports are started the same as "soup tickets," and are sent directly across the page with period made at end of each line; when through sending the loads announce the empties. Example:

(Hr. detail) HI BN "ON" ":25 PM."
(fm) Chillicothe 16
(to) Dspr (.)
Trn 116 d 4 10 PM Eng 896 Engr L S Morgan
Has Lds 17 Sheep Kansas City, Tons 450 (.)
11 Hogs do Tons 330 (.)
1 Horse Stk Yds Via U P Trains Tons 30 (.)
Mts 4 C & N W Bx Home Tons 48. Sig King.

CAR REPORT LOCAL.

These reports differ in form on different roads, but the principle is the same.

In sending this report announce it as "cars," sign your office call and then send the letter over such part of the report as you have to fill out. Example: B 2 E 1 M 3 Q 4 R 12 U 3 V 8, and again sign your office call. The operator in the Dispatcher's office has a similar form upon which he places the numbers under the letters as you name them.

CARS WANTED.				CARS WEST.				CARS EAST.			
Box	Stock	Gond	Flat	Box	Stock	Gond	Flat	Box	Stock	Gond	Flat
A	B	C	D	E	F	G	H	I	J	K	L
	2			1							

TO UNLOAD				EMPTY ON HAND				EMPTY TO SPARE			
Box	Stock	Gond	Flat	Box	Stock	Gond	Flat	Box	Stock	Gond	Flat
M	N	O	P	Q	R	S	T	U	V	W	X
3				4	12			3	8		

In sending this report the tonnage of all cars to be moved either empty or loaded must be included.

CAR REPORT—FOREIGN.

Orders for foreign cars are addressed to the Train Dispatcher, but must be on the foreign report. The Dispatcher then turns the foreign report over to the Car Service Agent.

Received From	Time Received	Sent By	Received By
CN	3:25 PM.	G	AS

From West Chicago Ill 16

To F.W.H. Chgo

Order No. 4 **Time Filed** 3:15 PM

A. Cars Wanted (Number) One

B. Initials Mather

C. Class of Cars wanted Feed & Water

D. Size of Cars wanted 36 ft

E. Where Wanted West Chgo

F. Date wanted 19

G. To be loaded with Export Cattle

H. Destination New York City

J. How routed Via Chgo & M C Ry

Signed M Cannon

Agent.

In sending the above report it should be announced by the Form Number, or as Foreign, and send as follows:

(Hr 46) CN G "AS"
(fm) West Chicago 111 16
(to) F. W. H. Chgo
Order No 4 Filed 3:15 PM
A One
B Mather
C F & W
D 36 ft
E West Chgo
F 19
G Export Cattle
J Via Chgo & M C Ry
Sig M Cannon Agt.

An accident report will be sent similar to the above by cipher letter; they are used to save time; at the same time to give clear account of what is wanted.

GENERAL INSTRUCTIONS IN COMMERCIAL MESSAGE WORK.

In handling commercial messages in the ordinary telegraph office, two sets of message blanks are used; each set is composed of one sending and one receiving message form; the sending and receiving forms in each set are exactly alike. One set, which is used for Day messages, is printed in black ink, and is called Black, or Day message forms; the other, which is used for Night messages, is printed in red ink, and is called Red, or Night message forms.

A message addressed to a place to which it is being sent (one which is not to be relayed or transferred), is called a CITY.

A message addressed to some place other than the

place to which it is being sent (one which is to be relayed or transferred), is called a THROUGH.

A message will be understood to be a Day, or on a black form, unless the word Red or Night, is made in the signals announcing the beginning of the message.

If we have a day message addressed to some person in Chicago, and we can by using our line or wire, communicate direct with Chicago office, as soon as the operator at Chicago would answer his call, we would give him the following signals, "Hr city." He would at once know that we have a Day message addressed to some person in Chicago, and would copy on the black form. In case it was a night message, we would say, "Hr city red," or "Hr city nite," in which case he would copy on the night message form.

If our message was a day and addressed to some person in Boston, Mass., and Chicago was our relay office, we would say, "Hr tru." The operator at Chicago would at once know we have a message to be copied on the day form which is to be relayed or sent on some other line from his office to destination. In case the message was a night, we would say, "Hr tru red," or "Hr tru nite." He would then copy on the night message form.

Thus we have the following signals which are used to announce the beginning of a message:

Hr city	Black form
Hr tru	Black form
Hr city red	Red form
Hr tru red	Red form
Hr city govt	Black form
Hr tru govt	Black form
Hr city red govt	Red form

Hr tru red govt .....Red form
Hr Cable .....Cable form

Any of the above signals mean get your message blanks, I have a message for you, and are sent by the sending operator, but never copied by the receiving operator. Messages between the larger offices, which have considerable business, are numbered, commencing with No. 1 at the opening. Sent messages to each office being numbered separately, received messages from each office being numbered separately.

After the signals announcing the beginning of a message, will be sent the number of the message and the office call of the sending office, then the sending operator's sign; following his sign "ck" indicates the check which gives the number of words subject to tariff, and tells whether a message is paid, to be collected, or free; (if free, explaining why) will follow; then the signal "fm" announces the place from and the date will follow, then the signal "to" announces that the address will follow; then the signal "period (.)" announces the beginning of the body will follow; then the "sig" announces that the signature will follow.

ORDER OF TRANSMISSION.

1. The number of the message and official call of the sending office.
2. The sending operator's personal sign.
3. The check of the message.
4. The place from and date of the message.
5. The address of the message.
6. The body of the message.

7. The signature of the message.

Example of transmitting a simple commercial message:

Hr city No 1 BN AH ch 5 Paid
fm Shelbina No 19
to Adams Bros. & Co.
Brookfield, Mo.
Will arrive five ten tomorrow. Sig James Parker.

THE SENDING FORM.

Let us now make a study of the following form, which being printed in black ink, and a sending form, indicates that it is a day sending blank.

RECEIVER'S No. refers to whoever accepts or received the message from the customer. In the large commercial offices the person who accepts the messages from the public is known as the receiving clerk, and he would place under the words, "Receiver's No." his personal sign and also number it. Operators at small stations would place only their personal sign under the words "Receiver's No." The object being to have the sign of the person who receives the message from the customer upon the blank, in case the message be not understood the same can be referred to him.

TIME FILED refers to the time the message was presented by the sender at the sending office for transmission, but has no reference to the time it is transmitted by wire.

Check refers to the number of words contained in the message which are to be counted and charged for, except in the case of collect message. The word "collect" is

THE WESTERN UNION TELEGRAPH COMPANY.

INCORPORATED

23,000 OFFICES IN AMERICA. CABLE SERVICE TO ALL THE WORLD.

This Company **TRANSMITS** and **DELIVERS** messages only on conditions limiting its liability, which have been assented to by the sender of the following message. Errors can be guarded against only by repeating a message back to the sending station for comparison, and the Company will not hold itself liable for errors or delays in transmission or delivery of **Unrepeated Messages**, beyond the amount of tolls paid thereon, nor in any case where the claim is not presented in writing within sixty days after the message is filed with the Company for transmission.
This is an **UNREPEATED MESSAGE**, and is delivered by request of the sender under the conditions named above.

ROBERT C. CLOWRY, President and General Manager.

NUMBER	SENT BY	REC'D BY	CHECK
1 HI	AH	VC	6 Paid.

RECEIVED at Brookfield Mo 9:25 AM 7/19 **1904**

Dated Chillicothe Mo 19

To James Perkins,

931 Main St,

Brookfield, Mo.

Come home at once mother worse.

Walter Perkins.

added in the check to assist in indicating that the tolls of the message are to be collected. The word collect in the check of the message is never charged for.

Let us now presume that the above message has been presented at Chillicothe, Mo., office for transmission, and as it meets all the requirements of Rule 1, the operator will observe Rule 2 and see that the month, and the day, are correctly noted thereon; by referring to his time-piece he finds the time it was presented to him to be sent was 9:19 A. M., which he will place under the words, "Time Filed," he will place his personal sign, which we will presume as "AH," under the words "Receiver's No." Now by carefully reading every word, he finds according to Rules 3 to 8, inclusive, there are six words to be counted and charged for, which makes the check 6 paid. If the sender had desired it sent collect, and met all the requirements of Rule 13, he would have made the check 7 collect, instead of 6 paid.

He should obtain and file the address of the sender, if not well known, in case any reply or service should be received pertaining to the message, the sender can be notified.

RECEIVING FORM AND HOW TO COPY ON THE SAME.

Let us presume that the operator at Chillicothe, who has the message for Brookfield, sends it over the wire while the operator at Brookfield makes a copy of the same on the receiving form below. Office call for Chillicothe, "HI;" Brookfield, "BF;" operator's personal sign at Chillicothe, "H;" Brookfield, "VC."

THE WESTERN UNION TELEGRAPH COMPANY.

INCORPORATED

21,000 OFFICES IN AMERICA. CABLE SERVICE TO ALL THE WORLD.

ROBERT C. CLOWRY, President and General Manager.

Receiver's No.	Time Filed	Check
AH	9:19 AM	6 Paid

SEND the following message subject to the terms on back hereof, which are hereby agreed to.

Chillicothe Mo 7/19 1904.

James Perkins

931 Main Street

Brookfield. Mo.

Come home at once mother worse.

Walter Perkins.

1 BF 9:25 AM AH VC.

☞ READ THE NOTICE AND AGREEMENT ON BACK. ☜

RECEIVING FORM.

After calling "BF" and receiving his reply, operator at "HI" would say, "Hr city." The operator at "BF" would at once know that "HI" had a message for him, and it is a day message, and to be copied on a day message form. He would, therefore, get the above form and copy as follows: Operator at "HI," after giving him the signal "Hr city," would send the number of the message, and his office call which being the first message today would be "No 1 HI." Operator at "BF" would write "1 HI" under the word number; operator at "HI" would then send his personal sign, "AH," which the operator at "BF" would write under words, "Sent By," and would write under his own personal sign "VC" under the words "Received By;" operator at "HI" would then say, "Ck 6 Paid." Operator at "BF" would write "6 Paid" under the word "Check;" operator at "HI" would then say "fm Chillicothe Mo 19." Operator at "BF" would write "Chillicothe Mo 19" on the same line after the word "Dated ....."; operator at "HI" would then say, "to James Perkins." Operator at "BF" would write the name of "James Perkins" after the word "To"; operator at "HI" would then make a "comma (,)" which in this case means to the receiving operator, drop a line for the address; following the comma the operator at "HI" would say, "931 Main St." The operator at "BF" would write on the line below the name commencing about half way under the name, "931 Main St.;" operator at "HI" would make another "comma (,) Brookfield, Mo." Operator at "BF" would observe the comma this time also and commence about half way under the street address and write "Brookfield, Mo."; op-

erator at "HI" would then make a "period (.)" and send the body and signature as follows: "Come home at once mother worse sig Walter Perkins." Operator at "BF" would then copy the body and signature on the blank space provided for that purpose, omitting the abbreviation "sig." On the line, "Received at ..... 190.." the operator at "BF" will observe Rule 32 and place "Brookfield, Mo., 9:25 A. M., July 19, 1904," and will count the number of words in the body of the message, see that they agree with the check, and otherwise satisfy himself that the message is correct in every way, and then will acknowledge receipt of the same by giving the signal OK, his personal sign and office call as follows: "OK VC BF." The operator at "HI" will time his sent copy according to the following form:

TIMING OF SENT COPIES.

Copies of sent messages when transmitted should be timed in the following form: 1 BF 9:25 AM AH VC. "1" is the number of the message to Brookfield office on that day; "BF," the office call for Brookfield, to which the message is being sent; "9:25 A. M." the time transmitted: "AH" the sending operator's personal sign; and "VC" the receiving operator's personal sign.

It is quite customary for the sending operator to place this form upon the sending blank with his left hand while transmitting the message with his right. It is found quite difficult for operators of considerable experience, but with constant trials the beginner can soon master this important step.

BREAKING IN COMMERCIAL MESSAGES.

When breaking in commercial messages, should you miss in the message number, say—"No;" in the sending operator's personal signal, say —"wo;" in the check, say —"ck;" in the name of the place from which it was sent, say—"fm;" in the state, say—"state;" in the date, say—"date;" in the name of the addressee, say—"to;" in the street number, or in the case of the party in whose care addressed, say—"comma (,);" in the beginning of the body or text, say—"period (.);" in the body or text give the last word received; in the signature, say "sig." If for any reason you should fail to receive a message after a part or all of it has been transmitted, or in case you make a "bull" in your copy which would make it necessary to have the message repeated, say—"ga anr" or "ga ahr."

MISTAKES IN CHECKS.

Suppose that in the following message either the sending operator had failed to send, or the receiving operator had failed to copy the word "wire."

21 MD CR BP 10 Paid.
Madison Wis. 22
James Person,
Kankakee, Ill.

Can you meet me Great Northern Chicago Monday wire answer.

MILTON CLARK,
10:14 AM.

The receiving operator would at once discover that there were only nine words, in which case he would say, "9w," meaning I have only "9 words." The sending operator would review his copy and find ten words, and would say "ck 10 Paid and make a period and repeat the first letter of each word as follows: c y m m g n c m w a." By following each letter closely the receiving operator would discover that he had no word which commenced with "w" after the word Monday and would say "ga monday;" the sending operator would repeat "monday wire answer" and the error would be corrected.

COMMERCIAL MESSAGES EXPLAINED.

In the following messages the combinations of letters inclosed in the parenthesis () are sent by the sending operator, but not copied by the receiving operator; those in quotation " " are copied by the receiving operator, but not sent by the sending operator.

MORE THAN ONE ADDRESS.

When a message is addressed to two persons in the same place or town and delivery is to be made to each, it will be charged for as two messages.

Example:

(Sturges receives city.)
(Hr city mk 2 cys No) 1 BN AN "HW" (ck) 10 Paid.
(fm) Hannibal Mo 22
(to) C L Brown and Geo Clark,
Sturges, Mo.
(.) Meet me Kansas City Hudson House Eleven o'clock Monday bring papers.

(sig) P D Kitt.
"11:15 AM"

The manner of transmitting the above message will be determined by the Manager or Chief Operator of the sending office. It may be sent to both persons at one transmission, or to each one separately; if only one transmission is made the sending operator who makes the last transmission should tell the receiving operator to make 2 copies, as follows: (Hr city mk 2 cys), so he may at one writing with manifold make a copy for each address.

When a message is addressed to two persons in the same place or town and delivery is to be made to either, it will be charged as only one message, but the second address, together with the connecting word "or" will be included in the count and charged for.

Example

(Brookfield received city.)
(Hr city No) 4 MR ED "RD" (ck) 14 Paid 3 exa wds.
(fm) Palmyra Mo 22
(to) J K Wheeler, or Ed Page,
Care Bacon Elevator,
Brookfield Mo
(.) Phone Ella I bought load mules waiting for car home tomorrow.

(sig) Wm Hopper
"12 K Noon"

In the above message we have 3 extra words which are the three extra words in the address, "or Ed Page" while there are only eleven body words. They are called extra words because they are not a part of the body, yet must be counted and charged for; therefore, they are mentioned in the check as extra words. All words in a message which according to the rules must be counted and charged for, and are not in the body, are mentioned in the check as so many extra words.

STREET ADDRESSES.

Great care should be taken to obtain from the sender a good, clear address for each message. The importance of the address cannot be over-estimated. When the address given seems insufficient a better one should be requested. Example:

(Moberley receives City.)
(Hr City No) 41 BF FS "JK" (ck) 8 Paid
(fm) Brookfield Mo 22
(to) M L Quinn,
Traveling salesman for Hibbard Spencer Bartlett & Co.,
Try Hotels and 326 Wentworth Ave.,
Moberley, Mo.
(.) Go to St Louis first train meet George answer.
(sig) Mrs M L Quinn
"3:15 P M"

In the above address it might seem that extra words appear to be used, but whenever it is necessary to make a lengthy address, which will insure prompt delivery, do so rather than necessitate sending several service messages.

MORE THAN ONE SIGNATURE.

Whenever a message has two or more signatures and they are not in the nature of a firm, Mr & Mrs, or John Smith & Family, all will be counted and charged for except the last. Example:

(Shelbina receives City.)
(Hr city No) 16 GH OA "HX" (ck) 16 paid 3 exa wds.
(fm) Birmingham Mo 22

(to) Rev A L Appleby,
Pastor M E Church
Shelbina, Mo
(.) Will you meet our Sunday School at picnic at Seven Oak Farm Friday.
(sig) S M McGee, Elmer Ford.
"4:25 PM"

In this message we also have 3 extra words, as we count and charge for all signatures when there are more than one except the last.

TITLE WORDS.

Whenever a signature has a title of more than two words or whenever there are words after the signature which are not title words, each word will be counted and charged for. Example:

(Hannibal received Relayed.)
(Hr tru No) 23 BN WR "GR" (ck) 12 Collect 3 exa wds
(fm) St Louis Mo 22
(to) Melvin Clarksdale,
On Train No 6, H & St J Ry,
Monroe Mo
(.) Work Shelbina Geo Thompson here have wired firm.
(Sig) Geo M. Holder,
Agent Deering Machine Co
"8:29 AM"

In the above message we have four words after the signature, only one of them being a title word, "Agent" (which is allowed free) therefore, we count and charge for "Deering Machine Co" as 3 extra words together with 8 body words and the word "collect" in the check which is counted but not charged for.

REPORTING DELIVERY.

Whenever the sender of a message wishes the company to notify him of its delivery.

Example:

(Kansas City receives Relayed.)

(Hr tru No) 8 CL CR "RG" (ck) 18 Paid 2 exa wds
Rept Dely
(fm) Chicago Ill 22
(to) Dr J B Freeman,
68 Main St,
Macon, Mo
(.) Will send papers today Title will have to be made perfect before I can accept it.

(sig) Dr N J Moreland,
"12:27 PM"

In the above message there are two extra words in the check "Rept Dely" which are counted and charged for and placed there by the sending office to notify the receiving office, that a notice of delivery must be given.

Example:

(Kansas City receives Relayed.)

(Hr tru No) 3 CN RG "CR" (ck) 11 collect
(fm) Macon Mo 22
(to) Dr N J Moreland
Chicago, Ill.
(.)Delivered your message to Dr J B Freeman nine AM.

(sig) L S McDonald,
Manager "2:10 PM"

REPEATED MESSAGE.

Whenever the sender wishes his message repeated or telegraphed back to the originating office for comparison.

Example:

(Kansas City receives City.)

(Hr city No) 9 GH NS "G" (ck) 11 Paid 2 exa wds
Rept Bk
(fm) Birmingham Mo 22
(to) Adams Bros & Co,
Kansas City Mo
(.) Send by express Range casting twenty nine fifty four,
(sig) Field Hdw Co.
"7:14 PM."

In the check of the above message there are two extra words "rept Back" which are counted and charged for. They are placed in the check by the sending office to notify the receiving office, that the message must be repeated for comparison, which should be done immediately before giving OK. A half rate will be charged for the repetition in addition to the charge for the message.

SPECIAL DELIVERY.

Delivery charges to be paid by the sender.

Whenever a message is to be especially delivered beyond the free delivery limits of the terminal office, and for which the delivery charges are not given in the tariff book and the charges are to be paid by the sender.

Example:

(Bucklin received City.)

(Hr city No) 12 CD SR "B" (ck) 11 Paid exa wds Rept Dely Chgs
(fm) Laclede Mo 22
(to) L A Martin,
3 1-2 miles southeast town,
Bucklin, Mo
(.) When can you meet me to arrange contract.
(sig) George Perdin.
"10:18 AM'

The above message is to be delivered by special messenger 3 1-2 miles southeast of Bucklin, Mo., and the charges are to be paid by the sender. In which case the sending office inserts in the check the word "Rept Dely Chgs" which are counted and charged for. They are placed in the check to notify the receiving office to have the message delivered and notify them by Service of the amount of charges so they can be collected from the sender.

When the charges are to be paid by the addressee.

Whenever a message is to be specially delivered beyond the free delivery limits of the terminal office, and for which the delivery charges are not given in the tariff book, and the charges are to be paid by the addressee.

Example:

(Ottumwa receives relayed.)

(Hr tru No) 5 CR MK "JF" (ck) 12 Paid 3 exa wds Dely Chgs Gtd.
(fm) Des Moines Ioa 22
(to) S O Warren,
Cattle Breeder 5 miles east, Chillicothe, Mo

(.) Offer twenty five good steers average four five twenty.

(sig) W A Drake,
"9:03 AM"

In this message we also have 3 extra words in the check "Dely Chgs Gtd" which are counted and charged for and placed there by the sending office to notify the receiving office, that the charges are guaranteed, but should be paid by the addressee.

EXTRA DATES.

Whenever a message is to be forwarded according to Rules, the name of the originating office and the date will be counted and charged for as a part of the message. Example:

(As message appears when first received at Boston.)
25 BN FN WR 11 Collect
Buffalo N Y 22
John Brown,
Transient,
Boston, Mass.
Meet me next Monday at ten oclock in the forenoon.
H Smith,
8:19 AM

For example, if the above message had been sent by "this" line from Buffalo to Boston, and John Brown had left Boston before the message arrived and had left a request, that all messages received for him be forwarded care Hudson House, Fall River, Mass. Boston would mark out certain words and add others as per following example:

8:25 AM 15
~~25 BN FN WR 11~~ Collect 33 & 35 4 exa wds.

Buffalo, N.Y. 22, Via Boston Mass. 22

John Brown,

~~Transient~~ Care Hudson House,

~~Boston, Mass.~~ Fall River, Mass.

Meet me next Monday, at ten o'clock in the forenoon.

H. Smith,

~~8:19 AM~~

(As message appears marked ready to forward.)

You will notice in the above message four extra words appear which are the originating office and the date (Buffalo, N. Y. 22) which are to be counted and charged for. In the check, numbers appear which are the tolls to be collected. Suppose the rate from Buffalo to Boston to be 35 and 2 and from Boston to Fall River 25 and 2: then a 11 collect message from Buffalo to Boston would cost 35c and a 15 collect message from Boston to Fall River 33c. The message being a "received collect" message, in which case Boston would check it so the rate from Boston to Fall River which is 33c would appear in the check first, as the "this" line tolls, and the rate from Buffalo to Boston which is 35c would appear in the check second, as the "other" line tolls.

(As message appears when copied at Fall River.)

B FB P 15 Collect 33 & 35 4 exa wds.
Buffalo N. Y. 22, Via Boston, Mass. 22.
John Brown,

Care Hudson House,
Fall River, Mass.
Meet me next Monday at ten oclock in the forenoon.
H Smith
8:39 AM.

Fall River would deliver and collect from Brown 33 & 35 or the total 68c.

OTHER LINE MESSAGES.

Whenever a message is to go over any "other" lines to reach the destination, the name of the transfer station should appear on the check from the originating office to the transfer office. Example:

(Kansas City receives Relayed.)
(Hr tru No) 7 HI MS "WF" (ck) 7 Paid Via St. Louis
(fm) Chillicothe Mo 22
(to) Alvin Perryman,
Ballwin, Mo
(.) Meet George St Louis Friday important business answer.
(sig) M L Hardlin,
"8.28 AM"

In the check of the above message we have the words "Via St. Louis" which are not counted or charged for, only placed in the check to indicate that the message is paid Via St. Louis.

Whenever a message is received over "other" lines at the proper station indicated by the tariff book, the name of the transfer office and also the date should appear on the same line with the originating office. Example;

(Chillicothe receives City.)
(Hr city No) 12 KC WF "MS" (ck) 9 Collect an ans
(fm) Ballwin Mo 22 Via St Louis Mo 22
(to) M L Hardlin,
Chillicothe Mo

(.) Will meet George Union Station ticket office Friday.

(sig) Alvin Perryman,
"1:28 PM"

It might seem in the above message that there were extra dates, but by referring to the tariff book we find that St. Louis is one of the proper places for a message from Ballwin to reach this Company's lines, and it is placed there, so the office of destination may know both the originating and the transfer office, in order that the tolls may be computed Via the transfer office.

You will note that the above message is an answer to the preceding message and it is customary to send the answer to a message, when such message makes some request of the addressee, collect. In the check we find the words "an answer" which are placed there to remind the receiving office that it is an answer to some message which has been sent from his office; in case a prepaid message requires an answer the addressee may send an answer collect and will not be required to make a deposit.

WHEN AN ANSWER IS PREPAID.

Whenever the sender of a message wishes to prepay for an answer to his message, the sending office will place in the check the wire signal "33" which will not be counted or charged for. Example:

(Cameron receives City.)
(Hr city No) 32 HB B "AS" (ck) 10 Paid & 33
(fm) Hannibal Mo 22
(to) Geo Thompson
Mgr Foot Ball Team.
Cameron, Mo
(.) Can you accept our offer for thirteenth others wanting date.
(sig) M L Stevens.
"8:10 AM"

Upon receipt of a message bearing the wire signal "33" in the check, the receiving office will if possible obtain an answer and send the same "collect" without requiring any deposit from the sender.

NIGHT MESSAGES.

A night message will be written upon a night message form; they are sent at reduced rates and if presented any time during the day, and it is so requested, they will be accepted at night rates and held until 6 PM and sent as soon thereafter as possible. Example:

(Kansas City Receives Relayed.)
(Hr red tru No) 5 KG AN "SN" (ck) 12 Collect Night
(fm) Breckenridge Mo 22
(to) J L McCandlish
Indianapolis, Ind
(.) Offer ten cars good mill screenings seven ten immediate acceptance.
(sig) Breckenridge Elevator Co.
"9:45 AM"

In the above message the word "red" is found in the signals which announce that it is to be copied on Night Message Form, and also in the check the word "night" is placed, indicating that the message will be charged for at night rates. ALWAYS begin night messages with the word RED and also send the word NIGHT in the check. An office which is not kept open, will before closing, transmit its "night" messages; if any night messages are left over until morning they will be transmitted before new business is taken up.

CODE MESSAGES.

Code messages are composed of words found in the ordinary dictionaries but so arranged as to give no meaning without the use of a code book; such messages are transmitted at ordinary tariff rates. Example:

(Kansas City receives Relayed.)
(Hr code tru No) 3 GH ED "MA" (ck) 6 Paid
(fm) Birmingham Mo 22
(to) Warner & Wilbur,
Commission Merchants,
Chicago, Ill.
(.)Alert Anvil and abacus demand probable.
(sig) Robert Elliott
"8:16 AM"

A code message is usually preceded by the word "code" which puts the receiving operator on his guard. The above message, to an operator, has no meaning, but should be handled very carefully and every letter sent and copied unmistakably correct, and be very particular,

crossing every "t" and dotting every "i," so they may be readily translated by the addressee. Translated the above message would read "Buy 10,000 bushels No 2 wheat for May delivery and buy 100 bales of January cotton margin twenty points." Much money is therefore saved in telegraphing by the use of codes. All leading branches of business have separate and different codes and it would be useless to try to decipher their messages without a copy of their code book.

CIPHER MESSAGES.

Cipher messages are in reality used for the same purpose as code messages. They are composed in whole, or part, of figures, letters, characters or words not contained in dictionaries or a combination of either or all of them, having no sense unless interpreted by means of a key in possession of the sender and receiver. Example:

(St. Joseph receives City.)
(Hr city No) 5 BN RK "TD" (ck) 29 Paid Cipher.
(fm) Hannibal Mo 22
(to) Keller Mfg Co.
1225 Madison St.
St. Joseph Mo
(.) Maeotis qr7ef 1740 aedeui zyrstf96 heavy qzrnm 9658. (sig) Johnson & Co.
"9:19 AM"

To count the above message study the rule covering such messages. The receiving operator should not OK a cable, code, or cipher message until he has repeated the body to the sending operator for comparison. This

should be done to protect against possible errors, regardless of the requirements of the rules.

GOVERNMENT MESSAGES.

Government messages relate to the official business of the government and have preference over all other business. Example:

(Moberly receives City.)
(Hr pink govt No) 56 KC FL "Z" (ck) 13 Paid Govt.
(fm) Washington D C 22
(to) Weatherman,
Moberly, Mo
(.) Generally fair tonight and Tuesday warmer west portion tonight.

(sig) Cox
"4:38 PM"

In all government messages you count the address, body words and the signature, or commence after the word "to" and count everything. ALWAYS begin a government message with the word GOVT, and also put the word GOVT in the check.

DEAD-HEAD MESSAGES.

Messages of employes of an urgent social or domestic character may be sent free and the check will show the reason for its acceptance without payment of the tolls. Example:

(Sturges receives City.)
(Hr City No) 5 MA RN "Q" 9 D H Opr
(fm) Ottumwa Ioa 22
(to) Edgar P Walker,
Sturges, Mo
(.) Mother and Mollie leave tonight meet them seven o'clock

(sig) G L Walker
"7:33 PM"

A message of this sort must be approved by the manager or superintendent in accordance with the rules.

CABLES.

Cable messages sent or received should be written on cable blanks and must always be prepaid. Example:

(Form of Transmission)
(Hr Cable No) 8 CN MS
(fm) Liverpool 5
(to) Sherlock
St. Louis (Mo)
(.) Abhor 36-4

(sig) Ole

In cables the check is not sent, only the number of words which appear immediately after the originating point. No date is given in transmission, but is filled in by both sending and receiving operator. To count cables begin at the word "to" and count everything except where the state is in parentheses ( ). It is not to be counted. If it is not in the parentheses it is to be counted. Counting of cables will be found different

CABLE MESSAGE.

THE WESTERN UNION TELEGRAPH COMPANY.

INCORPORATED

All **CABLE MESSAGES** received for transmission must be written on the Message Blanks provided by this Company for that purpose under and subject to the conditions printed thereon and on the back hereof which conditions have been agreed to by the sender of the following message

THOS. T. ECKERT, President and General Manager

TWO AMERICAN CABLES FROM NEW YORK TO GREAT BRITAIN.
CONNECTS ALSO WITH FIVE ANGLO-AMERICAN AND ONE DIRECT U. S. ATLANTIC CABLES.
DIRECT CABLE COMMUNICATION WITH GERMANY AND FRANCE.
CABLE CONNECTION WITH CUBA, WEST INDIES, MEXICO AND CENTRAL AND SOUTH AMERICA.
MESSAGES SENT TO, AND RECEIVED FROM, ALL PARTS OF THE WORLD.

OFFICES IN AMERICA:

All Offices (21,000) of the Western Union Telegraph Company and its Connections.

OFFICES IN GREAT BRITAIN:

LONDON:
No. 21 Royal Exchange, E. C.
No. 109 Fenchurch Street, E. C.

LIVERPOOL: No. 8 Rumford Street.
GLASGOW: No. 29 Gordon St. and No. 4 Waterloo Street.
BRISTOL: Backhall Chambers.

(*Form as received and copied.)

RECEIVED at

8 CN MS ON

Liverpool 5

Sherlock,

St Louis (Mo)

Abhor 36/4. Ole.

OK MS & ON 8:54 AM.

from messages, and a thorough study of the cable rules is needed. ALWAYS repeat the cables, and time them on the face with both sending and receiving operator's signal.

A press message, or query, should be written upon a pink blank at a relay office, and should receive prompt service. The check of such message shall contain the words "Day Press rate" or "Night press rate" the same as press for publication.

They are sent by some newspaper correspondent to some newspaper stating some happening or occurrence and inquiring the amount of matter desired for publication; they are charged for at the same rate as press for publication. No message to be rated less than ten words.

Example:

(Kansas City receives Relayed.)
(Hr tru pink No) 12 Hi Z "DA" (ck) 18 Collect N P R.
(fm) Chillicothe Mo 22
(to) Chicago Record,
Chicago, Ill
(.) Nancy Bell takes three out of five best time 2:16 3-4
Good story how much.

(Sig) Morgan,
"7:55 PM"

PRESS SPECIAL.

A despatch addressed to some newspaper containing an account of some happening or occurrence for publication, is charged for at press rates. Example:

(Chillicothe receives press special.)
(Hr spl No) 29 KC AB "B" (ck) 70 Collect N P R
(fm) St Louis Mo 22
(to) Constitution,
Chillicothe Mo

(.) Tony Faust's restaurant on Broadway, opposite the Olympic, was the scene of a robbery some time during the early hours of this morning, in which $4,100 in cash was stolen. The police are looking for Henry Stetten, alias Henry Stegger, who was employed as a bartender at the catering establishment, and who is suspected of having some knowledge of the crime.

Filed 7:10 PM (sig) Hemmings
"7:25 PM"

In the foregoing press message we have 70 words, 64 of which are the body, 1 in the check, and 5 in the Filing Time, which when placed in the body of despatches will be transmitted, counted and charged for.

SERVICE MESSAGES.

A message, pertaining to messages, which have been sent, regarding their delivery, collection of charges, etc., is called a service message.

ABBREVIATIONS USED.

N S N—No such number.
G B A—Give better address.
G S A—Give some address.
S F S—See former service.

S Y S—See your service.
D F S—Disregard former service.
92—Deliver.
Deld (or 92d)—Delivered.
Undeld—Undelivered.
Dely—Delivery.
Dely chgs gtd—Delivery charges guaranteed.
Rept dely chgs—Report delivery charges.
Rept dely—Report delivery.
Spl dely—Special delivery.
Sgd (or) sined—Signed.
Gte—Guarantee.

FORMS USED IN TRANSMISSION.

(Hr tru No) 28 MO K "FQ" (ck) Svc (or) Ofs.
(to) Omaha Nebr
(.) S F S yours red date Williams sgd Harrison 92d OK.

(sig) Monroe Mo. 22
"5:46 PM"

You will note that the above service or office message has no "from" and the number of the words are not mentioned in the check; it is also addressed to the name of an office and signed by the name of an office; the signature also contains the date. Never address a service message to an operator, agent, or any other person, except in making an answer to some service from a large office which might be signed for example: "Clark Chicago Ill 22," in which case you would address your service message to "Clark Chicago Ill."

EXPLANATION AND DIFFERENT FORMS USED.

Whenever a message is received with a request in the check to "Rept dely chgd," the receiving office will have the message delivered, pay the special messenger and send a service. Example:

To Laclede, Mo.
Dely chgs yours date Martin sgd Perdin One dollar which we check you other lines.

Bucklin, Mo. 22.

Whenever a message is received with the words "Dely chgs gtd" in the check, and the addressee refuses to pay for the special delivery, the receiving office will pay the special messenger and in accordance with the RULES, send a service. Example:

To Cameron, Mo.
We check you On Fifty other lines Dely yours date Warren sgd Drake.

Chillicothe, Mo. 22.

Whenever a message is received, and the addressee lives outside the free delivery limits, and the delivery charges have not been provided for, ask about the delivery charges by service. Example:

To Madison Wis.
John Benson lives four miles out do you gte One Twenty Five Dely yours date sgd Clark.

St. Louis Mo. 22.

When a service similar to the above is received and the delivery charges are guaranteed by the sender. Example:

To St. Louis, Mo.
SYS we gte One Twenty Five Dely chgs ours date Benson sgd Clark.

Madison Wis. 22

The above service must be charged for in accordance with the RULES.

WHEN CHARGES ARE NOT GUARANTEED.

To St. Louis, Mo.
S YS ours date Benson sgd Clark chgs not gtd, pls drop in P. O.

Madison Wis. 22

WHERE THE STREET NUMBER MENTIONED IN THE ADDRESS OF A MESSAGE CANNOT BE FOUND.

Example:

To Battle Creek, Mich.
N S N as 324 East Lake St and Huffman & Son unknown at 324 West Lake St, G B A or cant 92 your date sgd Peterson.

Indianapolis, Ind. 22.

WRONG ADDRESS.

To Geneva, Ill.
M L Sacket unknown at 1262 Wentworth Ave, G B A or cant 92 yours date sgd Mitchell.

Clark, Chicago, Ill. 22.

CORRECTED ADDRESS.

To Clark, Chicago, Ill .
Ours date Sacket sgd Mitchell is addressed to 1282 Wentworth Ave, Not 1262 we repeat 1282, S Y S and advise.

Geneva, Ill. 22.

WHEN MESSAGE IS DELAYED.

To St Joseph, Mo.
Can't 92 until 8 AM your Meek & Co sgd Clayball, office closed for the night and residence unknown.
Boston, Mass. 22.

IF THE ADDRESSEE OF A COLLECT MESSAGE REFUSES TO PAY FOR THE SAME.

To New York, N. Y.
Collect there your date Hutson sgd Reedy payment refused. Toledo, Ohio, 22.

WHEN A MESSAGE HAS BEEN LOST OR NOT UNDERSTOOD, ASK FOR DUPLICATE.

To Quincy, Ill.
Duplicate quick your date Carlton sgd Manning, message not understood.
Galesburg, Ill. 22.

ASKING FOR DUPLICATE OF A CERTAIN WORD.

To Rawlins, Wyo.
Duplicate eighth body word yours Nelson sgd Henderson. Medicine Bow, Wyo. 22.

DUPLICATING A CERTAIN WORD.

To Medicine Bow, Wyo.
S Y S eight body words ours date Nelson sgd Henderson is "waste" we repeat it "waste."
Rawlins, Wyo. 22.

WHEN NO STREET ADDRESS IS GIVEN.

To Adams, Nebr.
G S A or can't 92 your red 21st Parker sgd Ammerman. Englewood, Ill. 22.

Whenever the check in a message is anything else than "Day," it should be mentioned as in the above message.

WHEN A SERVICE HAS BEEN SENT AND ANOTHER FOLLOWS CHANGING THE FIRST.

To Adams, Nebr.
D F S have 92 OK your Red 21st Parker sigd Ammerman. Englewood, Ill. 22.

WHEN THE ADDRESSEE HAS CHANGED RESIDENCE.

To Pattensburg, Mo.
Clifton Pub Co. have moved from 936 West Clay St and present address unknown G B A or can't 92 yours yesterday sgd Adams Bros. Clark, Chicago, Ill. 22.

WHEN THE ADDRESSEE LEAVES TOWN BEFORE A COLLECT MESSAGE ARRIVES FOR HIM.

To South Bend, Ind.
Allen Thompson left city before yours date sgd Merdock arrived. Collect there. Warsaw, Ind. 22.

WHEN A MESSAGE IS SENT TO WRONG DESTINATION.

To St Joseph, Mo.
File but do not check our red 21st Randall sgd Peterson should have been sent to St. Louis, Mo. have resent it to St. Louis. Chillicothe, Mo. 22.

ASKING FOR QUICK ANSWER.

To Milwaukee, Wis.
Pls get quick answer or reason why ours yesterday Stockton sgd Clemons. Minneapolis, Minn. 22.

NUMBER SERVICE MESSAGES.

To Chicago, Ill.
Yesterday sent 97 received 210. Kansas City, Mo. 22.
To Kansas City, Mo.
No record your No 97 yesterday, Pls give skeleton.
Hitchcock, Chicago, Ill. 22.

GIVING SKELETON.

To Hitchcock, Chicago, Ill.
Ours yesterday No 97 to you ck 13 Paid fm Breckenridge, Mo. to James Armstrong Milwaukee, Wis. sgd Widley Bros. recd opr MA 225 PM, S Y S and advise. Kansas City, Mo. 22.

COMMERCIAL NEWS DEPARTMENT.

That department of commercial telegraph which gathers and furnishes by wire, quotations and other news of grain and provision market.

The grain and provision market opens at 9:30 A. M. on the board of trade, and the quotations are sent out at different times until 1:15 P. M., except on Saturdays, when the close is sent at twelve o'clock noon.

ABBREVIATIONS.

GRAIN.		PROVISIONS.	
W	Wheat	P	Pork
C	Corn	L	Lard
O	Oats	S R (or) R.	Short Ribs

OPTION MONTHS.

F	January	N	July
G	February	Q	August
H	March	U	September
J	April	V	October
K	May	X	November
M	June	Z	December

GRAIN C N D.

(Hr cnd No) 4 CH AC "GO" (ck) C N D
(fm) Chicago Ill 22
(to) Quincy Ill
(.) WZ 1.05¼, K 1.04¼
CZ 41⅜, K 40¾@40⅞
OZ 30, K 29½
(sig) 9:30 AM Opening.
"9:41 AM"

PROVISIONS C N D.

(Hr cnd No) 5 CH AC "GO" (ck) C N D
(fm) Chicago Ill 22
(to) Quincy Ill
(.) PZ 13.00, K 12.50
LZ 7.65, K 7.85
SRZ 9.70, K 10.00
(sig) 9:30 AM Opening.
"9:43 AM"

ABBREVIATIONS USED IN LIVE STOCK C N D.

A.....Exact Receipts
B.....Exports
C.....Sales
J.....Left Over
K....Receipts Day Before
M.....Heavy
N.....Light
P.....Premium
X.....Mixed

OPENING LIVE STOCK C N D.

(Hr cnd No) 2 KC NF "SR" (ck) C N D
(fm) Kansas City Mo 22
(to) Cameron Mo
(.) Hogs 20,000 prospects stronger
Cattle 10,000 prospects steady.
Sheep 6,000 prospects unchanged.
(sig) 7:10 AM Opening.
"7:18 AM"

THE 8:40 AM C N D.

(Hr cnd No) 25 KC NF "SR" (ck) C N D
(fm) Kansas City Mo 22
(to) Cameron Mo
(.) A 20,000 B 11,292 C 5,121 J 2,854 K 21,000 average higher. M 500@517½ N 460@505. P 500@517, X 460@505. Cattle 10,000 including 300 southerns. Native steers 400@625. Southern Steers 250@375. Native Cows and Heifers 150@450. Stockers and Feeders 225@425. Westerns 300@450. Sheep, 6,000. Muttons 325@380. Lambs 400@415. Range wethers 325@400. Ewes 275@360.
(Sig) 4:40 AM
"8:48 AM"

GRAIN SPECIAL FOR PUBLICATION.

(Hr spl No) 56 KC J "AD" (ck) Collect D P R
(fm) Kansas City Mo 22
(to) The Gallatin Democrat,
Gallatin, Mo

(.) Wheat—198 cars—Dec. $1.05¼; May, $1.04¼; cash No. 2 hard, $1.07¼@1.10; No. 3, $1.04@1.08; No. 4, 96c@$1.04; rejected, 85@94c; No. 2 red, $1.12; No. 3, $1.08@1.10; No. 4, 98c@$1.06.

Wheat—Higher.

Corn—Dec. 41¾; May 40¾@40⅞; cash; No. 2 mixed, 48c; No. 3, 47½; No. 2 white, 48½; No. 3, 48@48¼c.

Oats—No. 2 white, 30@32c; No. 2 mixed, 29½c.

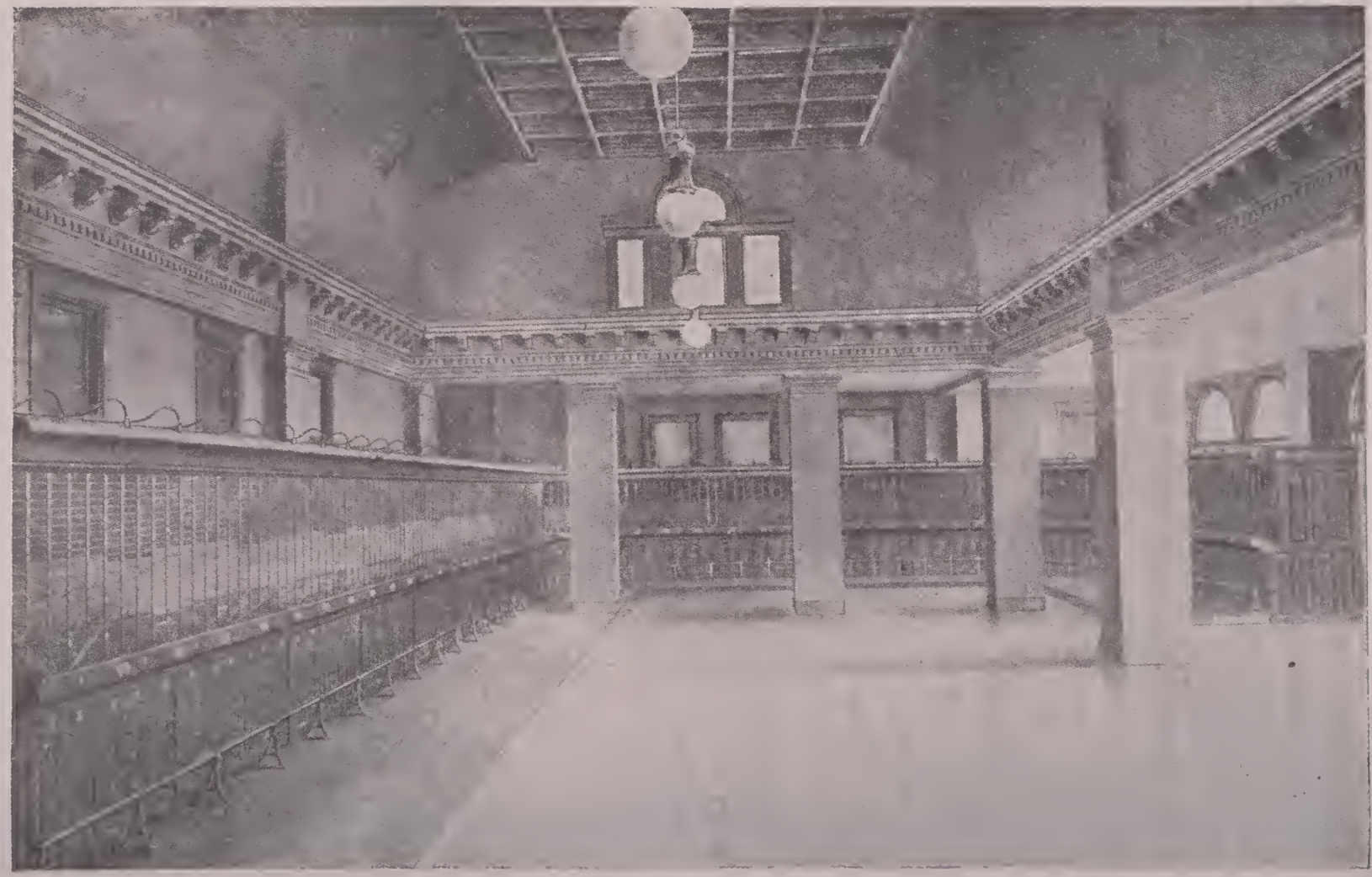
(sig) Watkins

Filed 4:37 PM. "4:40 PM"

THE TELEPHONE

TELEPHONES IN RAILROAD WORK

TELEPHONIC TRAIN DESPATCHING



Main Exchange, Four-Party Selective Ringing Switchboard.—Kellogg Switchboard and Supply Co

DESCRIPTION OF THE TELEPHONE.

The telephone is an instrument for the transmission of the energy of sound, and for the reproduction of the sound at a distant place. Sound is produced by the vibration of bodies; and different rates and kinds of vibration cause different kinds of sound. The rapid vibration of a sounding body produces rapid disturbances in the surrounding air, and in objects in contact with it; and thus waves of sound are sent out radially in all directions from the sounding body. The vibratory character of sound waves can be very simply illustrated by singing or talking loudly to a piece of writing-paper held by both hands about an inch from the mouth. A tremulous motion of the paper will be felt. When one is near a sounding body, such as a church bell, the sound is heard distinctly; but on moving further and further away the loudness very rapidly diminishes. There are many reasons for this. Intervening objects quench the force of the sound waves; moisture and fogs absorb their energy; while the increasing area of their action, as the distance from the source of sound becomes greater, must of course diminish their intensity. To transmit the sound over a great distance we must confine the energy of the sound waves to one single path, instead of allowing those waves to scatter in all directions. The well-known speaking-tube does this to a large extent; and the toy string telephone is constructed on this principle. The latter of these is a very instructive invention of early date.

It consists of two parchment discs or diaphragms, connected by means of a stretched thread of silk or cotton. On speaking to one diaphragm, and setting it in vibration, the string is pulled to and fro, setting the distant diaphragm in similar vibration, and thus causing it to emit the very words spoken to the first diaphragm. It is possible in this way to transmit speech nearly 200 yards, but with greater distances the increased weight of string, and

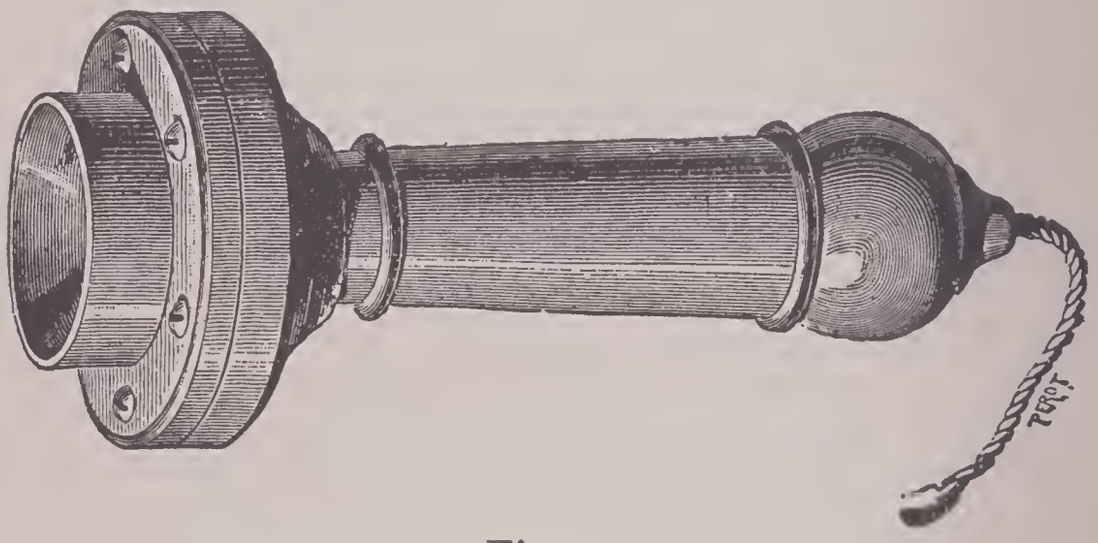


Fig. 1.

the numerous supports for it, prevent free vibration, and muffle the sound. But though mechanical impulses cannot well be transmitted over greater distances, there are other kinds of impulse which may be sent many hundreds of miles with but little diminution in their intensity. An electric current can be made to influence an instrument (such as a telegraph) thousands of miles away from the generator of the current. Now if the original sound impulses proceeding from any sounding body could be converted into electric impulses, varying in a similar manner, and these electric impulses, carried along a wire to a distant point, could be reconverted into similar sound im-

pulses, the transmission of sound would as completely be carried out as in the string telephone, with the additional advantage that the sender and receiver could be much further apart. Instead of a few hundred feet, the message could then be carried many hundreds of miles. This series of transformations is possible; it is involved in the action of the electric telephone. The first practicable electric telephone was invented by Prof. Graham Bell, and exhibited by him at the Philadelphia Exhibition of 1876. A general view of this instrument is shown in Fig. 1, and a longitudinal section in Fig. 2.

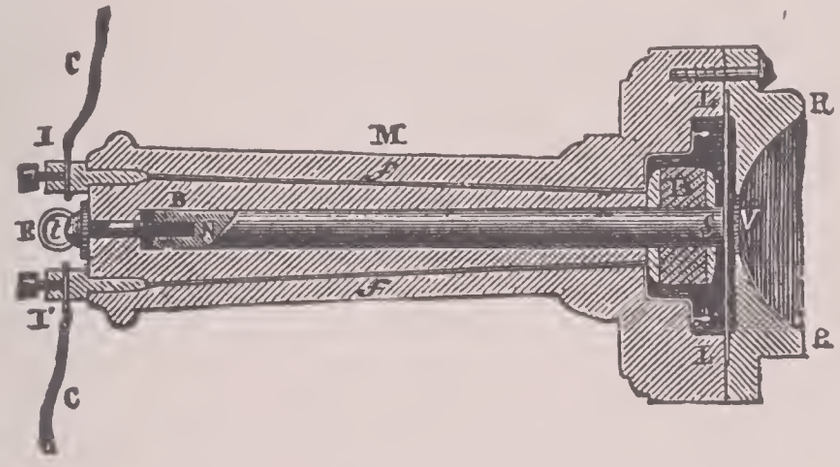


Fig. 2.

"An electric impulse may be started in a circuit in two ways, viz., by suddenly developing an electromotive force in the circuit, or by suddenly changing its resistance. Both these methods have been employed in telephone work. In the Bell telephone the sound waves produce electric impulses by developing a rapidly changing electromotive force. A permanent bar magnet, N S (Fig. 2), is fitted into a wooden or ebonite holder M, the general shape of which is shown in Fig. 1. The pole S projects into a circular cavity at the mouthpiece end of the holder, and is surrounded by a coil of fine insulated copper wire

wound on a bobbin B. The ends of this coil are connected to two binding screws I I by means of two wires *f f* passing through the holder. Immediately in front of the S end of the magnet is a thin diaphragm of ferrotype iron L L, clamped firmly at its edge, but free to vibrate in the middle. In front of this iron diaphragm is the mouthpiece R R, of the same material as the holder, which serves the double purpose of clamping the edge of the diaphragm and of directing the sound waves on to its surface. If two such telephones are connected by a pair of insulated wires C C (one from each binding screw), speech may be transmitted in either direction. A message spoken into the mouthpiece of one instrument sets the diaphragm in vibration, and the motion of the iron near the magnet causes a transient alteration of its magnetic condition, with the result that a transient electromotive force is developed in the coil of wire, and an electric impulse transmitted along the lines. A series of electric impulses, corresponding to the nature of the sounds producing them, are thus received at the distant telephone and pass round the coil within it. Momentary changes occur in the magnetism of the magnet inside this coil, and consequent changes in its attraction of the iron diaphragm in front of it. The diaphragm is thereby thrown into a state of vibration, the character of which will depend on that of the electric impulses producing it, and sound waves will be thrown off into the surrounding air. In this way the message spoken at one place is transmitted electrically, and reproduced many miles or even hundreds of miles away.

"It will be seen that the Bell telephone can be used both as a transmitting and as a receiving instrument. In general practice, however, it is only employed in the

latter capacity, some kind of *microphonic* transmitter being used in conjunction with it. The extra clearness in the reproduction of the message, and the increased distance over which it can be sent, are reasons for this differentiation of the apparatus. It is also more comfortable to have separate instruments for hearing and speaking.

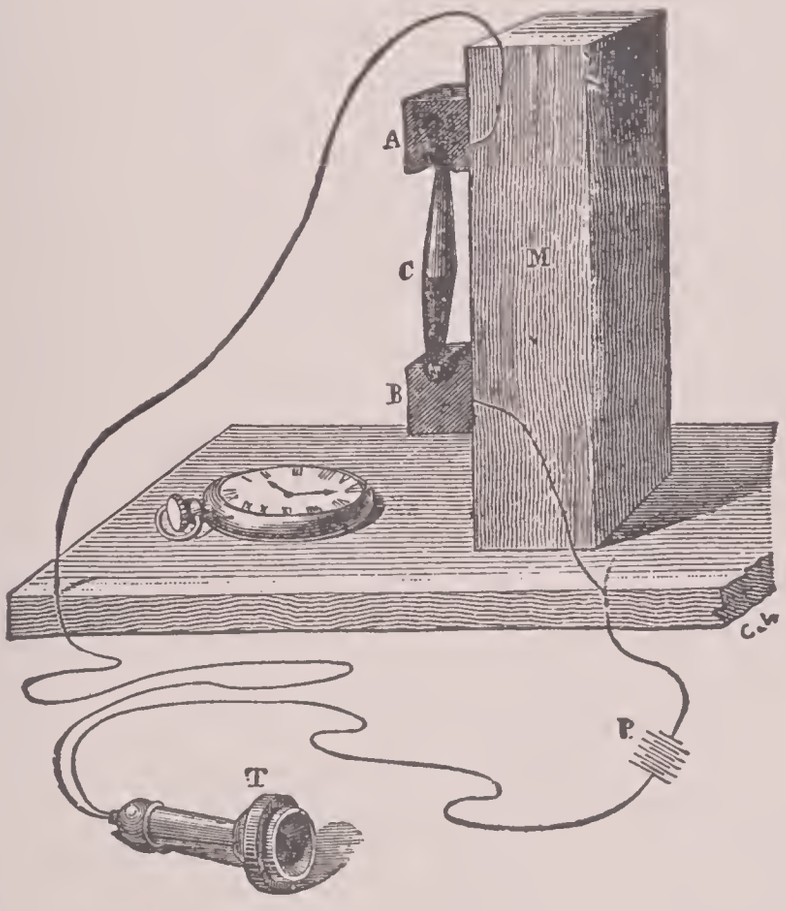


Fig. 3.

"Microphonic transmitters produce a series of electric impulses by setting up rapid variations, not in the electromotive force, but in the resistance of the circuit. The current is not generated by such transmitters, as in the Bell telephone; a separate battery being required in order to work them. The function of a transmitter is merely to rapidly and properly *alter* the strength of a current that

is already flowing in the circuit, just as a water-tap alters but does not produce the flow of water in the pipe leading from a tank. Microphonic transmitters are modifications of the microphone, an ingenious device, due to Professor Hughes, and illustrated in Fig. 3. It will be seen to consist of a light spindle of carbon C loosely supported between two carbon blocks, which A B are firmly fixed to a sounding-board M. The blocks and spindle form part of the circuit of a battery P, a Bell telephone T being also placed in that circuit. A fly walking on the sounding-

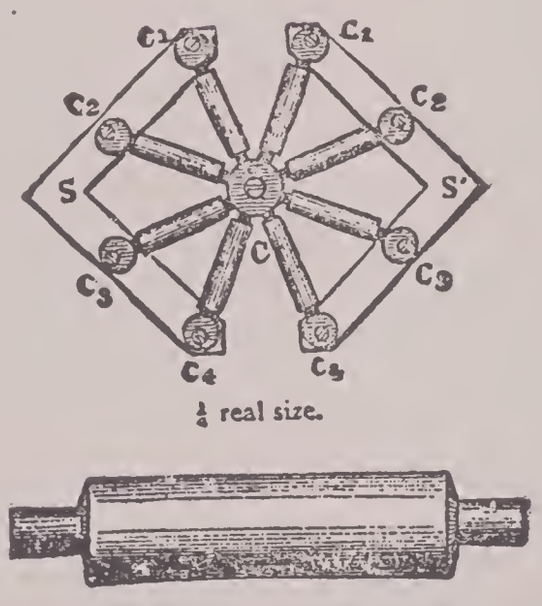


Fig. 4.

board produces a violent uproar in the telephone, and music played or words spoken near the instrument are reproduced in the telephone with moderate clearness. The action of the microphone is due to the fact, first pointed out by Du Moncel, that varying pressure between two carbon surfaces produces correspondingly varying electrical resistance of the contact. Thus the sound impulses set the carbon spindle, or the sounding-board and blocks,

in vibration and cause variations in resistance of the circuit, and thus propagate electric impulses in it.

"By combining several microphones, and arranging them in various patterns on the sounding-board, numer ous inventors have succeeded in producing transmitters which combine sensitiveness with accuracy, and which are in use on the various telephone exchanges of Europe and America. Fig. 4 shows the arrangement of microphones in the Gower-Bell transmitter, a full-sized carbon spindle being shown at the bottom of the figure. The Crossley

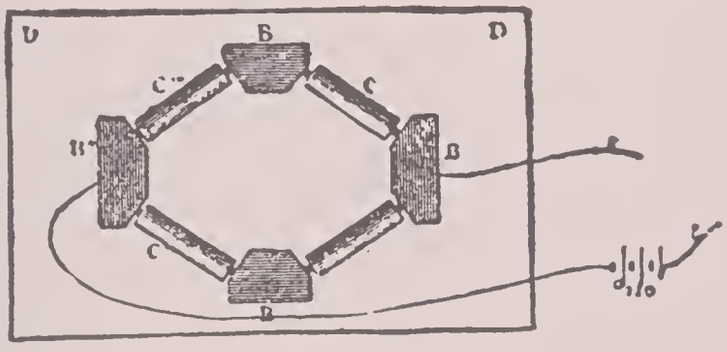


Fig. 5.

transmitter is shown in Fig. 5. In the form of carbon transmitter used largely at the present time in English telephone exchanges, the variations in pressure at the carbon contact are effected by the aid of a vibrating diaphragm. A sectional view of this form, which is known as the Blake transmitter, is shown in Fig. 6. A carbon button *k*, mounted on a brass holder *p*, and attached to a straight spring *g*, presses against the end of a short piece of platinum wire, which is supported by the spring *f*, insulated from the framework. This causes the other end of the platinum wire to press against the centre of the diaphragm *e*, which is supported all round its edge by the frame of the instrument. In front of the dia-

phragm is the mouthpiece *a*, while a screw *n* pressing against the lever *c* is used for adjusting the pressure between the carbon button and the platinum point. The electric current, conveyed from a battery, passes through the point of contact between the platinum and carbon, so that when the diaphragm is thrown into vibration a variation of resistance occurs at this point of contact, and electric impulses are generated.

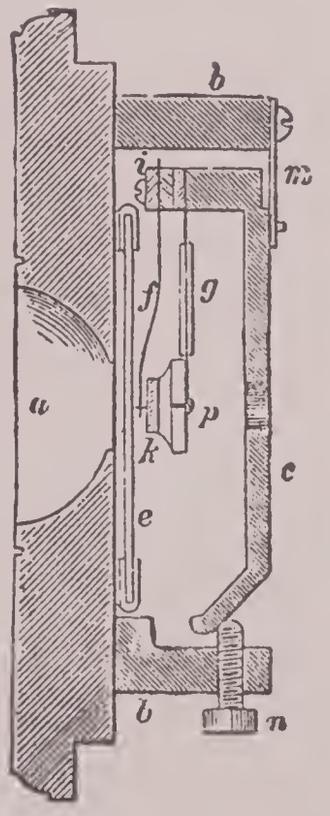


Fig. 6.

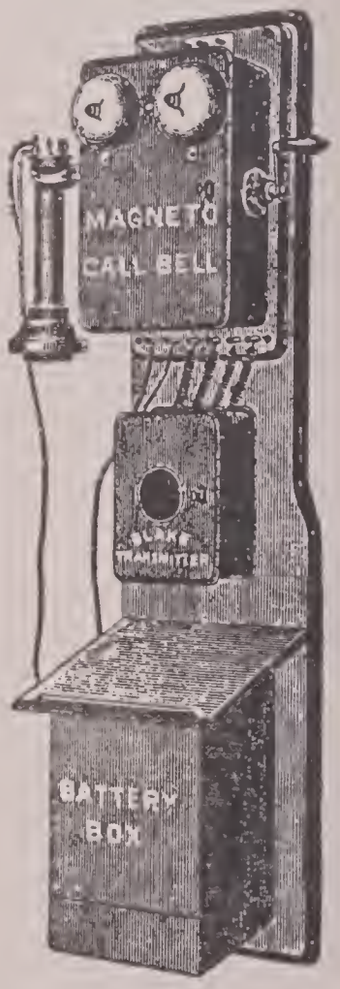


Fig. 7.

"In Fig. 7 we have a complete telephone apparatus such as is installed at a telephone subscriber's house. At the left, hanging on a hook, is the Bell receiver. The

square box in the middle is the Blake transmitter, while under it is the box containing the battery, and at the top, on the right, is the handle for ringing up the Exchange.

"It is important that the line or wire conductor between two telephone stations should possess the three following electrical properties:

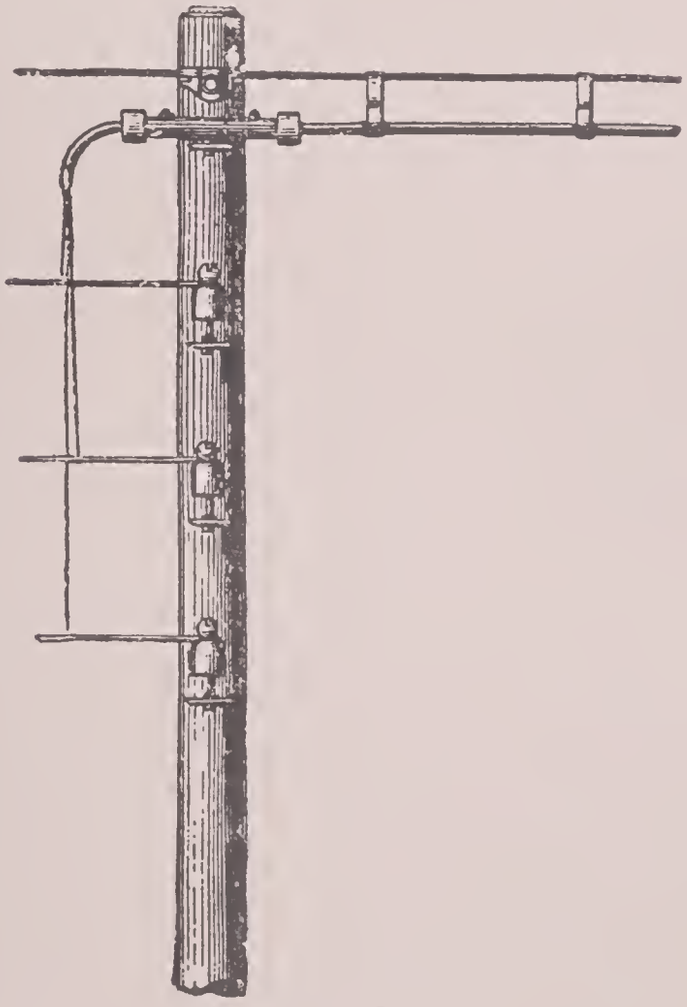


Fig. 8.

"(1.) It must be a good conductor. This is effected by using sufficiently large wires of a highly conducting metal, such as copper or phosphor-bronze.

"(2.) It must be well insulated; that is, the current must not be allowed to leak away from the wire. To se-

cure this in overhead lines, the wires are bound to porcelain insulators fixed to the iron or wooden posts, and in underground lines the wire is covered throughout its length with india-rubber, or some similar flexible insulating substance. Fig. 8 shows some overhead wires attached to insulators at the top of a pole; Fig. 9, a short piece of cable, consisting of several separate telephone

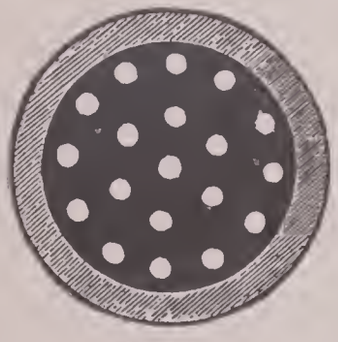


Fig. 9.

Fig. 10.

wires embedded in a mass of insulation; and Fig. 10 illustrates the manner of laying an underground cable. When a number of wires have to run parallel for some distance, a cable of this kind is often carried overhead, being held up by means of hooks attached to a strong supporting wire (Fig. 11).

"(3.) It must be free from magnetic disturbances of neighboring wires. This is secured by choosing a proper position for the line, and avoiding the use of iron wire.

Telegraph and electric light cables, if near telephone wires, are apt to affect them, producing loud noises in the telephone.

"(4.) It must have little or no *electrostatic capacity*. Underground and submarine cables are more liable to this defect than those overhead.

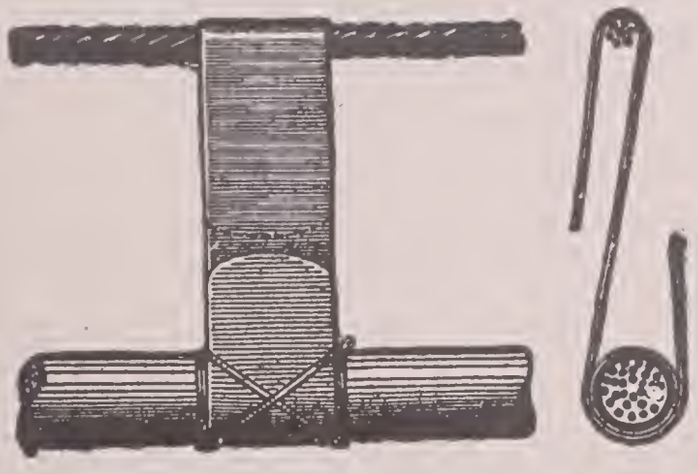
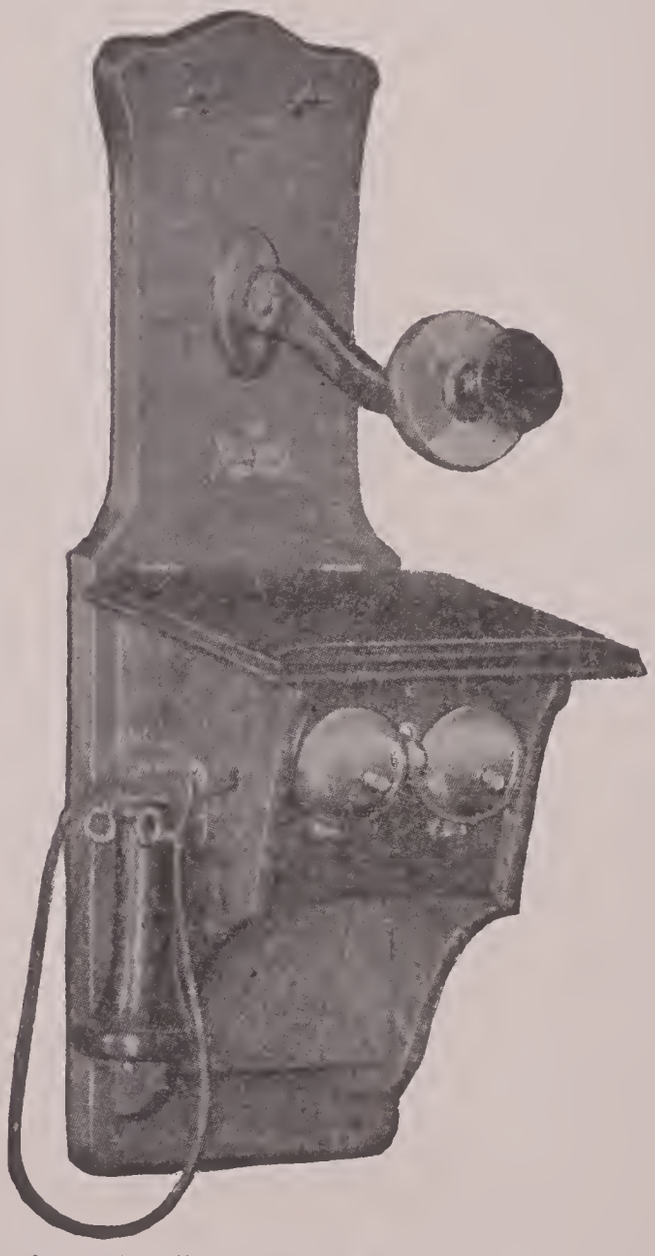


Fig. 11.

"Not lesser in importance than any other part of a telephone system is the switch-board. Indeed, without it telephony would be impossible. In describing the operation of a switch-board the following extract from a paper by Mr. S. P. Grace, read before the Electric Club, Pittsburg, Pa., fully explains a type of switch-board in general use, known as the "common battery system": "In a modern common battery office the lines are brought in underground in large paper insulated cables. These cables are made up of twisted pair wires insulated with spiral wrappings of paper and the whole enclosed in a continuous lead sheath. As many as 600 pairs of wires are sometimes placed in a single cable. The reason for using a paper insulated and lead covered cable is, first because of its low cost and second, that with a paper

insulation we obtain a very low mutual static capacity of each pair of wires. This low capacity is necessary in order not to seriously attenuate or distort the high frequency telephone currents traversing over the circuit.



Telephone for "Common Battery" Work.—Closed.

"The wires from the underground cables are ended in what is known as a main distributing frame. On the terminating end of each pair of wires is placed a carbon

plate lightning arrester and a fuse known as a sneak coil. The function of the carbon plate arrester is to discharge to ground any foreign current having a potential of more than 400 volts. If a current over .4 of an

Telephone for "Common Battery" Work—Opened.

ampere flows in the line this coil will heat up and melt a small block of fusible metal which causes the releasing of the line spring and the opening of the line to the switchboard.

"The telephone lines after passing through the arresters are carried through loose wires, known as jumpers, to the opposite side of the main distributing frame and then to the intermediate frame and from there straight to the switch-board.

"The object of the main frame is to allow the changing of the wires upon which a subscriber's line enters, without being obliged to change the number of his telephone instrument. The object of the intermediate frame is to permit of any telephone line being answered at any position of the switch-board, which is desirable in order to equalize the load on the different operators. Ordinarily each operator is obliged to answer from 100 to 200 lines. Your telephone line will enter the switch-board and appear at some position in a switch which is known as an answering jack. Directly above this answering jack is placed a small incandescent lamp, known as a line lamp. Your telephone line, besides appearing in an answering jack at some operator's position, will also appear in what are known as the multiple jacks in every third position of the entire switch-board.

"The question has often been asked how one operator at a switch-board can make connections with a telephone line which is answered by some operator probably 100 feet away. The explanation is simple. Each telephone line, besides appearing in front of a certain operator, is, as stated above, multiplied in front of every third operator, and is therefore within easy reach of all the operators. In a large switch-board there are sometimes as many as 30 jack switches for a single line, into any one of which an operator may plug and make connection with the line and therefore the subscriber connected with it. Each telephone operator is provided with a number of

flexible cords, on the ends of which are placed plugs which can be inserted into the answering and multiple jacks. The operation of the modern common battery relay switch-board is as follows:

"When a subscriber removes his receiver from the hook, immediately a small incandescent lamp lights in front of the operator. The operator will insert one of the plugs into the answering jack directly under the lamp, which by this operation will be automatically put out. She will then, by means of a listening key, connect her telephone circuit with the cord and plug used in answering, and will inquire the number wanted. She will then take the other plug connected with the same pair of cords and will reach up in the multiple and touch the jack switch of the subscriber's line wanted. If the subscriber's line wanted should be in use, the operator will be apprised of the fact by a sharp click in her ear, which signifies to her that this line is plugged in some other part of the switch-board and is therefore "busy." This is one of the very necessary features of the multiple system since it prevents two or more operators from connecting with the same line at the same time.

"If the line is not busy, the operator will plug into the jack switch and will send a signalling current over the line which will ring the called subscriber's bell. Until the called subscriber answers, a small lamp, known as a supervisory lamp, which is associated with the calling plug, will remain lighted. When the subscriber answers, this lamp is automatically put out. When both subscribers are through talking and hang their receivers on the hook, the supervisory lamps on both the front and back cords will be displayed, which is a signal to the operator that that pair of cords, and consequently the connected

lines, are no longer in use. She will then remove the plugs from the jacks, which operation automatically puts out the supervisory lamps.

"Should the subscriber wanted be in some distant office, it is only possible to make the connection by means of another operator located at the distant office. The orders for this connection are given over what is known as an order wire which permits the operator at the originating end to speak directly into the ear of a trunk opera-

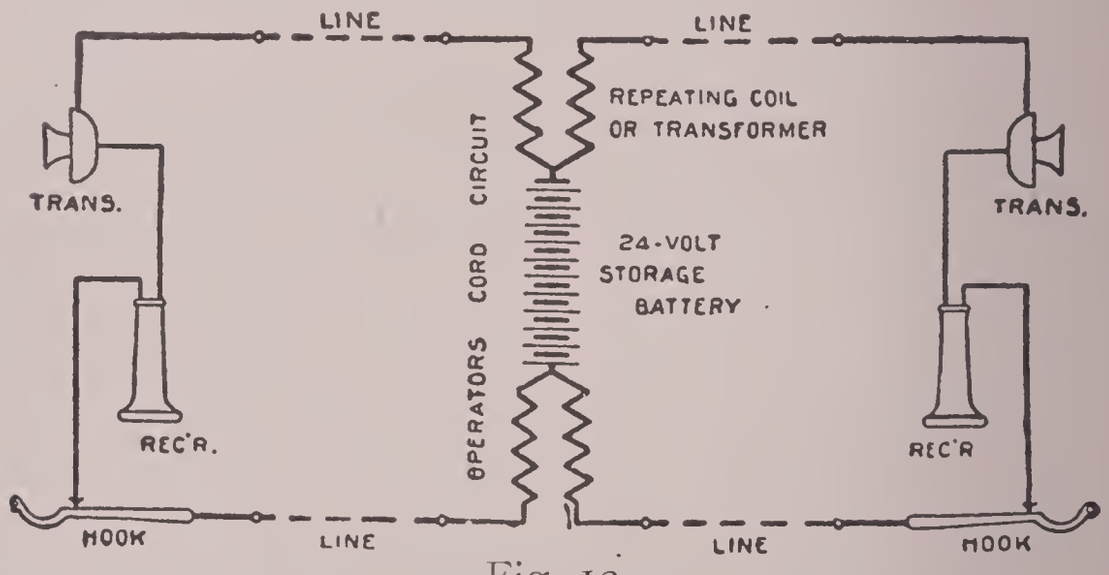
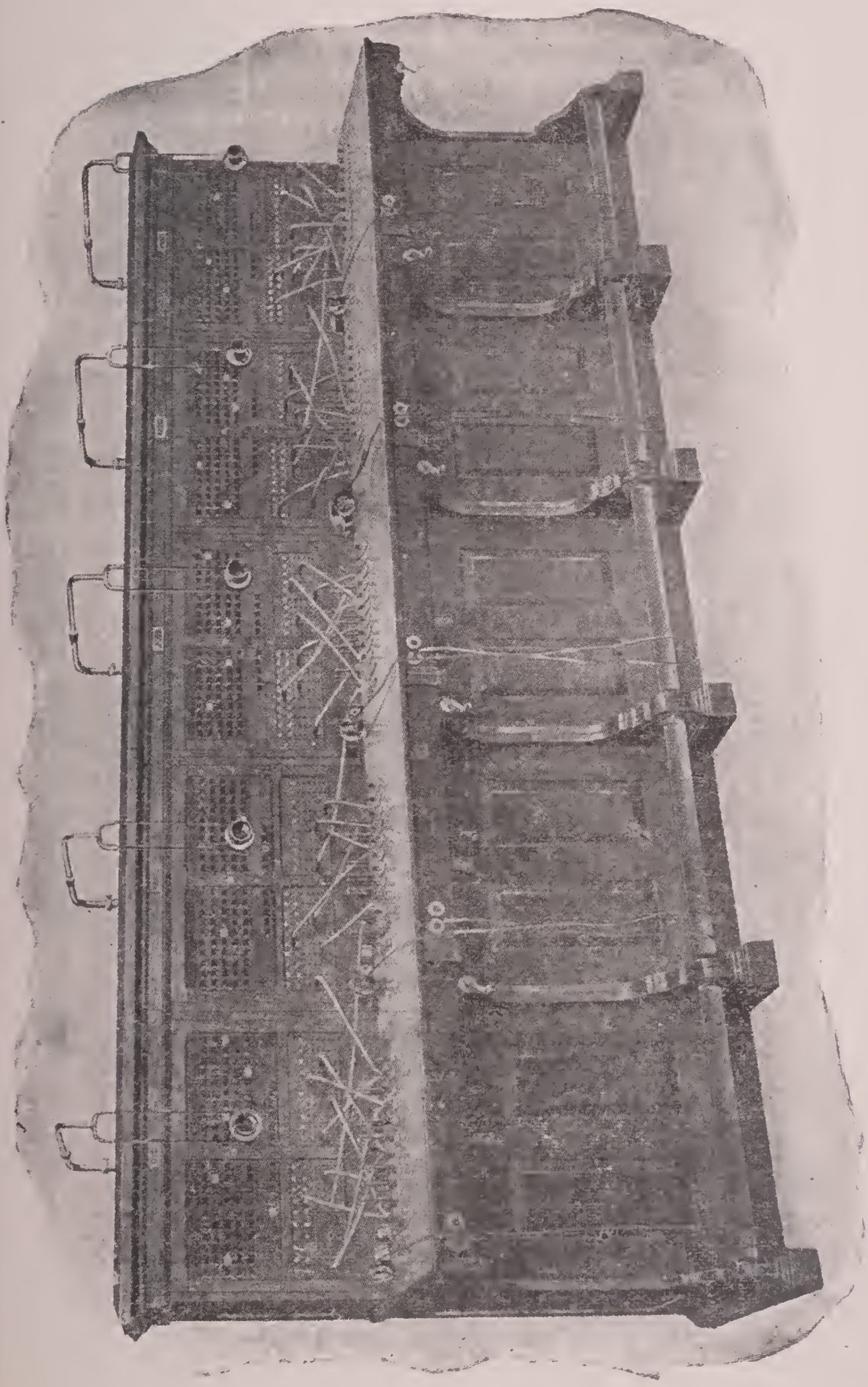


Fig. 12.

DIAGRAM SHOWING METHOD OF CONNECTING TWO SUBSCRIBERS' LINES.

tor at a distant office. The connection then, instead of being made directly, will be put up over a trunk line. The same signals as described are used with the exception that the originating operator receives all the disconnect signals and the act of her removing the plug from the trunk line automatically displays a lamp in front of the trunk operator at the distant office, which signifies to her that the trunk line is no longer in use. The operators at the distant office, who put up these trunk connections do nothing else. They never talk to the subscribers.



Switchboard Showing Lamp Signals.—The North Electric Co.

"The method of connecting together two subscribers' lines through a modern common battery switch-board may be clearly understood by reference to the diagrams of connections shown in Figs. 12 and 13.

"There are two principal systems of common battery transmission, the "repeating coil" and the "retardation." The repeating coil system is the one most generally used. It is shown diagrammatically in Fig. 12. In this system one large storage battery is used as a source of current for all the lines. When two telephone lines are connected, it is done by means of a flexible cord, in which cord is placed a repeating coil or transformer, each winding of which has the same number of turns. The centers of these coils are connected to the poles of the main battery, as shown in Fig. 12.

"It is apparent that any change of current in either branch caused by a variation of the transmitter resistance will, by reason of the mutual magnetic reaction of the repeating coil, induce similar currents in the other branch of the circuit. We will then have a variable current of alternating character superimposed on the direct current in each brand of the circuit. This superimposed alternating current represents the energy of the speech transmission. Since the resistance of the main battery is very low, there will be no appreciable change of potential over its terminals due to a variable current in any line, and we may therefore connect as many repeating coils, and consequently the same number of lines, without fear of there being cross-talk from one line to another.

"The following describes briefly the various operations which take place in the connection and conversation between two subscribers located in the same office. At the

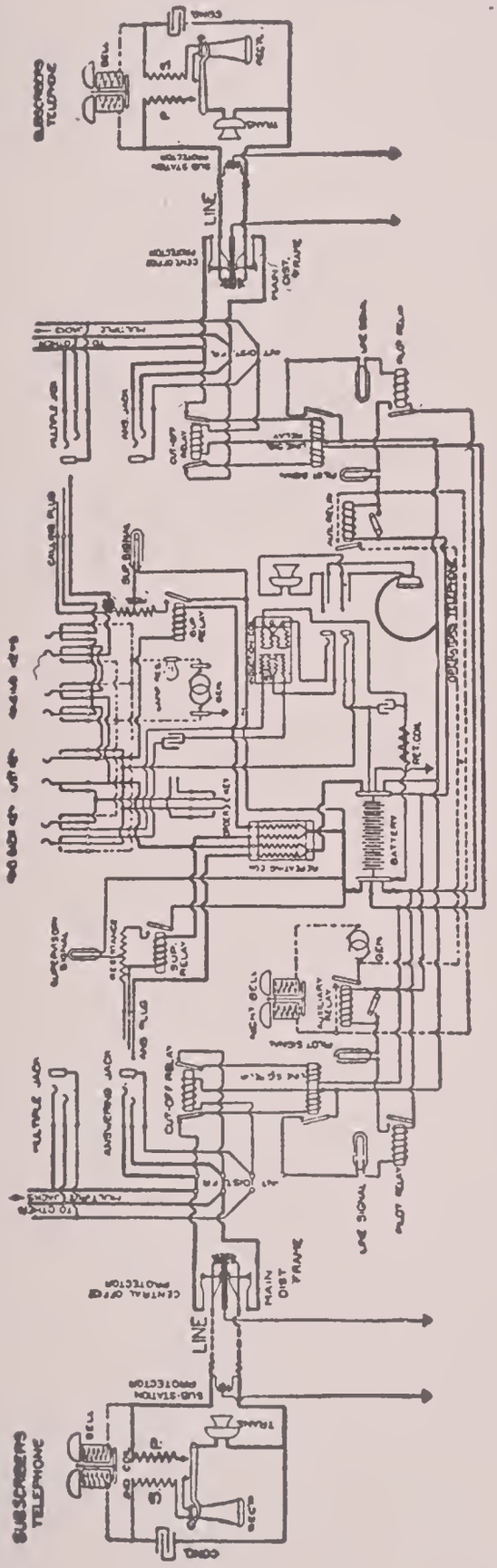


Fig. 13. DIAGRAM OF COMMON BATTERY SWITCH-BOARD CIRCUITS.

left of Fig. 13 will be observed a wiring diagram of a subscriber's telephone. This telephone may be a wall set, a desk set, or any one of the numerous types which are now in use for special cases. The apparatus in the telephone is practically the same in all cases and consists of a transmitter, a receiver, an induction coil, a condenser, a polarized bell and a hook switch.

"The functions of the transmitter and receiver have already been explained. The induction coil, which is nothing more than a small transformer, is used so that the receiver may be taken out of the line circuit, which carries the current for the transmitter battery. From Fig. 13 it will be noticed that the receiver is in a secondary circuit closed through a condenser. It has been found that direct current through the receiver is liable to demagnetize the permanent magnet and also injure the diaphragm.

"The condenser is placed in the instrument in order that the two sides of the line circuit may be kept open to the direct current which tries to flow from the central office main battery, thus preventing the operation of the line signal relay at central. The operator can ring the polarized bell at the subscriber's telephone through the two microfarad condensers, since for ringing purposes single-phase alternating current is used which passes readily through the condenser. From the subscriber's telephone the line passes through open wires or through a pair in a cable to the protectors on the main distributing frame at the central office.

"The underground and outside wire plant of a large telephone exchange is very extensive and great skill is required in the proper designing and constructing of the underground conduits, pole lines and aerial cables, so that

a high insulation may be maintained on all the lines and so that the wire plant will be valuable for use at any point where service is demanded. It is clear that no matter how good instruments or switch-boards may be, without good line construction, poor service will result. The best practice of to-day recommends that as much of the wire plant as is economical will be placed underground and that where the distribution is not heavy enough to warrant underground conduit, the wires will run in aerial cables on short heavy pole lines.

"After the line reaches the main frame it passes to the intermediate frame and then over to the relay track, where both sides of the line are connected through the contacts of the cut-off relay to line relay and the main office battery. At the intermediate frame a branch is taken from the line and connected to all the multiple jacks in the switch-board corresponding to the line number. One branch of the line is also connected to an answering jack in some particular operator's position.

"It will be observed that in the switch-board three wires and three jack and plug contacts are used for each line. Two of these wires are for the talking circuit, the third being a signaling or controlling circuit for the operation of the various relays, signal lamps, etc., which are necessary for a proper supervision of the connection. Let us observe what will happen when the subscriber removes his receiver from the hook. The rising of the hook will close the contacts of the switch and close the line at the subscriber's station through the transmitter, the primary of the induction coil, and the hook switch contacts. The line being now closed will permit of current flowing through it from the main battery, and since the line signal relay is inserted serially in this circuit at the central

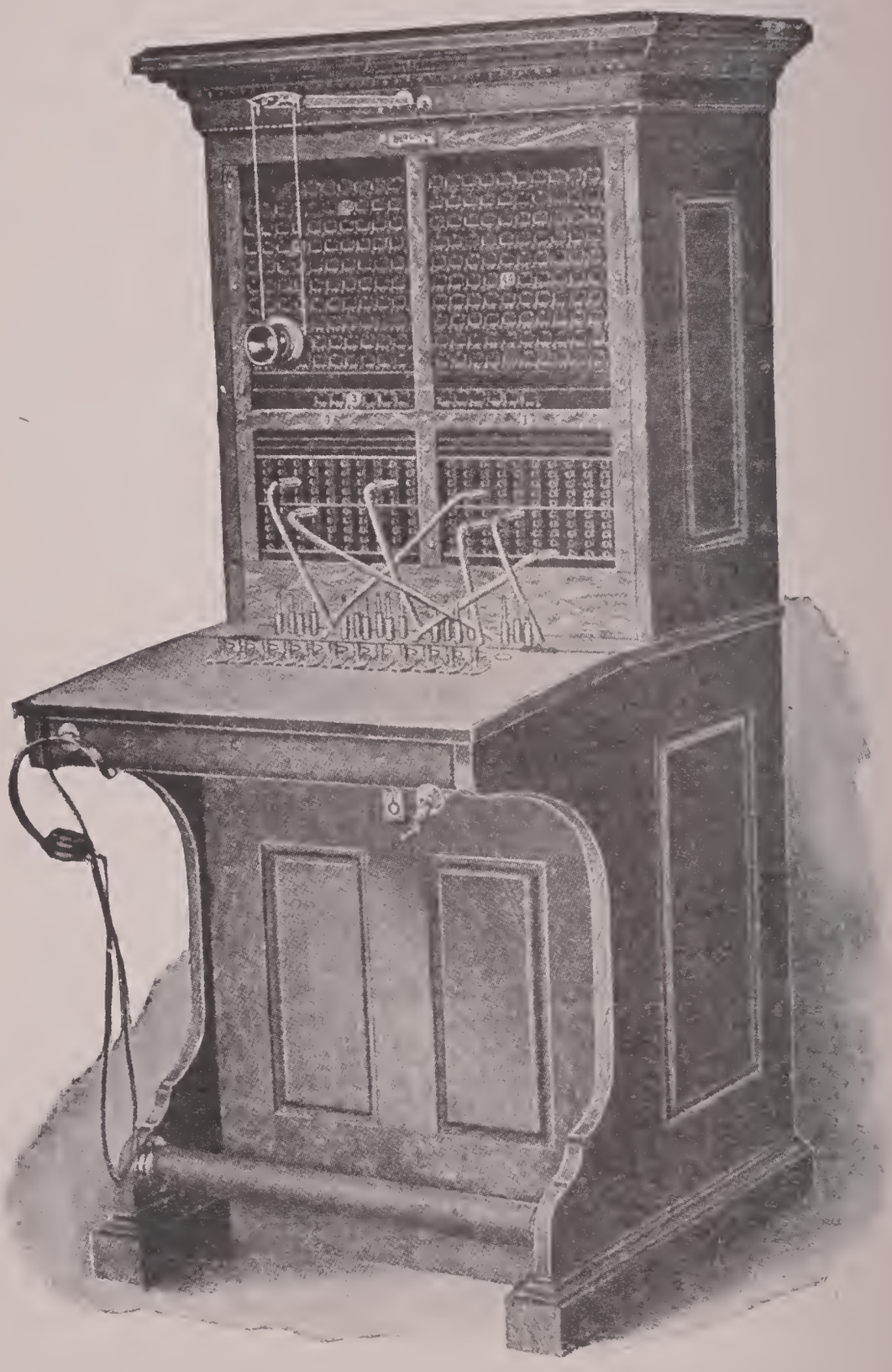
office its armature will be attracted which, closing a secondary circuit, will cause the lighting of the line lamp in the face of the switch-board adjacent to the answering jack of the subscriber who has called. The lighting of the line lamp is practically simultaneous with the removing of the receiver from the hook.

"As previously stated, the operator is provided with a number of pairs of double-ended plugs and cords which are so wired as to permit of the connection of two subscribers' lines. Upon seeing the line lamp light the operator will pick up a plug connected to one of her answering cords and insert it into the answering jack associated with the lighted line lamp. The inserting of the plug in the answering jack causes a flow of current in the controlling, or third wire, circuit. It will be noticed that this current in the third wire flows through the cut-off relays, thus causing its armature to attract and open the circuit through the line lamp. This causes the extinguishment of the line lamp automatically. As the subscriber has his receiver off the hook the line is closed at the telephone, and as soon as the plug is fully inserted the line current, which the instant before was broken by the cut-off relay, is re-established through one-half of the repeating coil and the cord circuit. The current flowing in the main line will cause the operation of the 10-ohm supervisory relay which is placed in series with one side of the cord circuit. This relay being operated will connect the 40-ohm shunt around the supervisory lamp, which therefore will not receive sufficient current to be illuminated. The operator will now depress her listening key which will connect her telephone set in parallel with the cord circuit which is connected to the subscriber's line. She will now speak into her transmitter and obtain from

the subscriber the number wanted. The operator's set is practically the same as an ordinary telephone, but arranged with switching devices so that it may be connected to the various cord circuits.

"Upon receiving the number wanted the operator will take the calling plug of the same pair of cords and reaching to the multiple jack of that number will touch the sleeve of the jack with the tip of the plug. In Fig. 13 the called subscriber's line is represented at the right of the diagram. If the subscriber's line wanted is plugged at some other part of the board the potential of the sleeves of all the multiple jacks of that line will be raised above the earth and under this condition if the sleeves of any of these multiple jacks are touched by the tip of a plug there will be a rush of current through the cord circuit which will cause a click in the operator's ear and thus inform her that the line is "busy." If the line wanted is not busy, which would be indicated by silence when the tip of the plug is touched to the sleeve of the jack, the operator will fully insert the plug and depress one of her ringing keys connected to the cord. This will send a single-phase alternating current over the line of the called subscriber through the condenser and bell located in his telephone. The ringing of the bell will summon the called subscriber to his telephone.

"The insertion of the calling plug has operated the cut-off relay and will prevent the called subscriber from flashing his line lamp when he answers the call. However, until the called subscriber answers the supervisory relay connected with the calling plug will not be operated and therefore no shunt will be around the supervisory lamp. The supervisory lamp will thus be illuminated and will clearly indicate to the operator that the

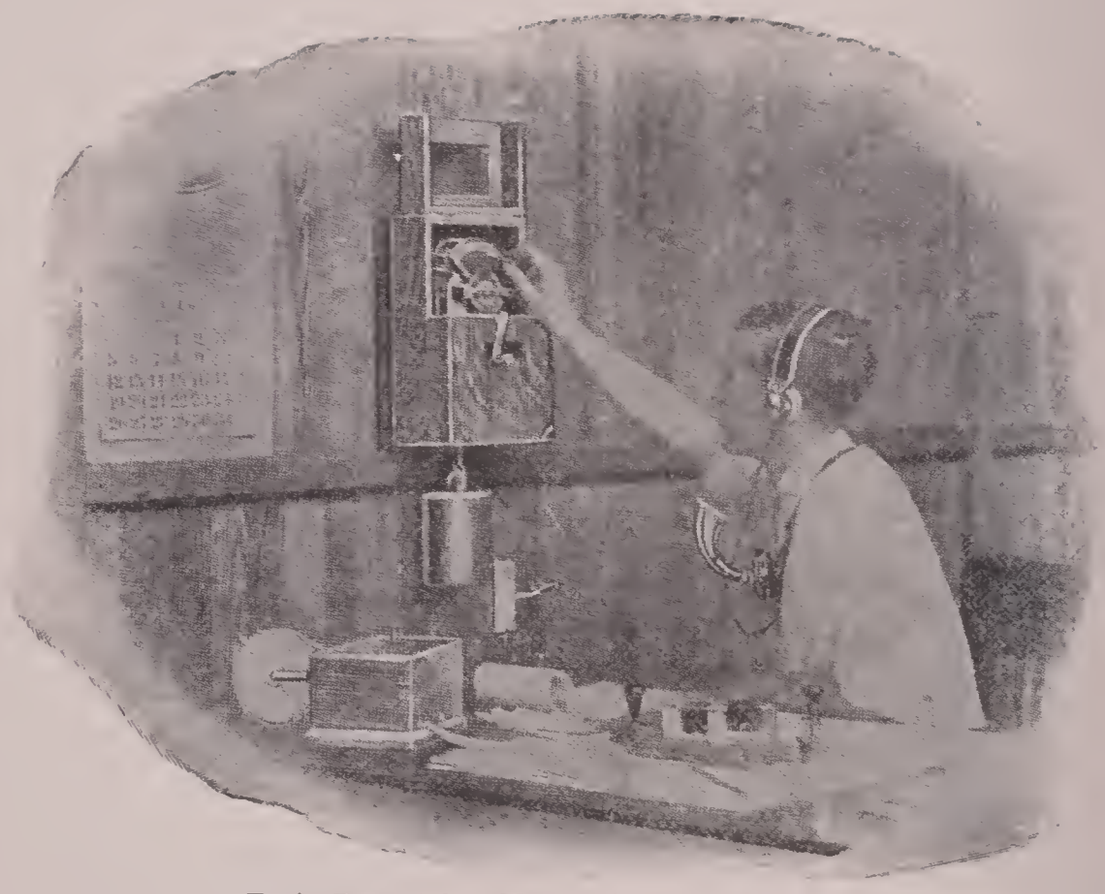


Unit Type Switchboard Magneto Call (200 lines)—North Electric Co.

called subscriber has not answered. She will therefore keep on ringing until he answers or finally sends back a "don't answer" report to the calling subscriber. Should he answer, current will flow through both sides of the line from the right-hand half of the repeating coil and will operate the supervisory relay, which will shunt the supervisory lamp and cause it to be extinguished. The connection now being completely established, the two subscribers will converse with each other on the principles outlined in describing Fig. 12. When the conversation is finished and both subscribers hang up their receivers, both lines will be opened at the hooks contacts and the supervisory relays will release. This will remove the shunt from around the supervisory lamps and cause them to be illuminated. The lighting of the supervisory lamps connected with the cord circuits indicates to the operator that the conversation is finished. She will then remove the plugs from both the answering jack and the multiple jack and all circuits will return to normal and all lamps will be extinguished.

"The circuits described show the connections which take place for local connections between two subscribers connected with the same office. In a modern telephone system in a large city this is only one of the many hundreds of circuit combinations which must be used. Suitable trunks and signals between relay offices are provided for local connections and for toll connections, also trunks between long distance boards and local boards, order wire circuits and ringing circuits to private branch exchanges, etc. So many are the circuit combinations that a complete description of them is practically impossible."

TELEPHONES IN RAILROAD WORK



Train Despatcher Master Station Equipment.

TELEPHONES IN RAILROAD WORK.

The constantly increasing use of the telephone in railroad work is an evidence that it is becoming more and more valuable, and it has now reached such proportions as to claim a distinct place in the organization and management of some of our large systems. On some there is a superintendent or supervisor of telephones, while on others the duties devolve upon the superintendent of telegraph or some other officer, but in either case they are of increased importance as compared with a few years ago. On many large railroad systems the telephone is an important feature. At certain large terminals there is a central office, and from this there are short lines to the roundhouse, the office of the yardmaster, stationmaster and numerous other places, so that each may be connected with any of the others or may communicate with distant points by means of long-distance wires. In the case of terminal stations the telephone takes the place of messenger service. Between points hitherto reached only by telegraph or train persons can converse directly instead of by the longer and more laborious method of writing telegrams, sending or carrying them to the telegraph office to be sent and received by regular telegraphers, then delivered at the other end and an answer returned in the same way. Work is made lighter, communications pass more quickly, and are much more satisfactory in their character than by the old methods.

A railroad system with a complete telephone system at its headquarters and also at each intermediate station

affords the means for an agent to communicate with the office of the superintendent, the general freight and passenger agent, the auditor or other offices much more quickly than by telegraph, and the general officers can get much more information from agents and others out on the line that would otherwise be practically impossible.

The telephone has been in use as above described for a number of years, during which time the skill of electrical engineers has been directed toward improving its reliability and accuracy of transmission, and this fact has undoubtedly done much toward its adoption as a means of assisting in train movements. To show the high standard it has attained in this respect it is stated that on a certain railroad line 310 miles in length conversation can be carried on in a whisper. If this be a fair sample of what may be accomplished it would seem that one of the greatest objections to using it for the movement of trains may be overcome.

The telephone is put to a very practical use by placing it at sidings and stations where there is no telegraph office. These places are a bugbear to the dispatcher—holes for trains to fall into. Much will be accomplished when they are entirely done away with. How many hours' delay they have caused and how many dispatchers have suffered on account of them we cannot tell. It may be impossible to keep an operator at every siding, but the expense of maintaining a telephone each place, whereby a train can obtain help against a superior train will be more than offset by the reduction of delays, which will be the sure result. Many roads are now providing all such places with telephone connection, and it is a most commendable move.

The telephone is also used with good results when

placed at station switches that are distant from the telegraph office. Where there are long sidetracks (and there are some that are two to four miles long) it is impossible to get orders to a train after it has passed the telegraph office, and when a train is near these outlying switches the telephone puts it in communication with the dispatcher, either directly or through the operator at the station, and many times a train can receive help in this way when it would otherwise be impossible, and a long delay thus be avoided. The same principle may be employed at freight yards where trains have work to do at points remote from the telegraph office. There are many such places that are out of sight of the telegraph office, and the operator can not tell when a train leaves the yard, thus making it impossible for the dispatcher to know when to expect it at the next station. This lack of information could be supplied if the telephone were used to notify the operator when the train is ready to leave.

The writer has for a long time had the impression that the telephone could be used entirely by the train dispatcher, and, in many ways, to better advantage than the telegraph. The dispatcher finds it necessary, in the course of his work, to ask many questions of the operators along the line regarding trains; when they will be ready, how long it will take to make the next station, how many cars or tons in the train, etc., and these require a considerable amount of time, especially if the operator is not first-class. Many times a conductor wishes to tell the dispatcher something in connection with his train, but the operator does not fully grasp his meaning, consequently can not give an intelligent account to the dispatcher, and much time is thus lost. By means of

the telephone the conductor and dispatcher can talk directly with each other.

Although the telephone has not yet been generally adopted for the dispatcher's use indications point toward that end. It has been used for some years to move

Taking Down a Telephonic Train Order.

trains in large city terminals, and on some roads the station block system is worked by telephone, and in various ways it is now utilized to assist in the handling of trains. One prominent Western system has all its section houses

supplied with instruments, so the section men can be called at any hour of the night. This saves much delay which often occurs in case of wrecks, washouts, etc., especially when the section houses are between telegraph stations, as many of them are. On another line there are portable instruments carried in each caboose, also in wrecking cars, tool cars, etc., and the wires on the poles are so arranged that these instruments may be cut in at any point between stations.

Line wires can now be used for both telegraph and telephone, so that they can be used at the same time for both, and neither interferes with the other. This is a great saving of expense for line wire, and is probably doing much to hasten the extended use of the telephone.

It would seem that the perfection of the telephone should prove a most valuable aid to the work of the train dispatching department, especially in the means it provides for communication between the dispatcher and the trains at places where telegraphic communication is impossible or impracticable.

TRAIN ORDERS BY TELEPHONE.

As a result of exhaustive tests made by one great railway it seems assured that the telephone will supersede the telegraph for the transmission of railway train orders within a comparatively short time. Accuracy and celerity in the handling of orders regarding the movement of trains are of the utmost importance in railway operation for the protection of lives and property, and, to a large extent, the profits from traffic are dependent upon them.

It has long been a theory that only the telegraph could be relied upon for the transmission of train orders, be-

cause it necessitated the writing of orders and a written receipt of them, thus avoiding misunderstandings which might arise from verbal messages. For this reason the tests by the Burlington of verbal train messages were watched with the greatest interest by officials of the Pennsylvania, Rock Island, New York Central, St. Paul, Erie, Northwestern, and other big railroads, with the result of a growing tendency in favor of the telephone for dispatching trains on steam railways. Special telephone apparatus and systems designed to meet the exacting requirements of such service have now been perfected. Other great railways in widely separated parts of the continent have made experiments with satisfactory results, and more than one large railway system has already put the telephone into use upon heavy main line divisions and preparations are being made to still further extend its use for transmitting train orders.

The importance of the telephone for the movement of trains is strongly emphasized in a paper upon the subject which was read before the Association of Railway Telegraph Superintendents, at Montreal, Que., June 24th, 1908, by Mr. W. W. Ryder, superintendent of telegraph, the Chicago, Burlington & Quincy Railroad, as follows:

"The substituting of the telephone for the telegraph in the handling of trains has been much discussed. Electric interurban roads early recognized the desirability of this means of communication for the purpose mentioned, and as the number and speed of their trains and the weight of equipment increased, necessitating a more exact method of dispatching, they extended their use of the telephone until it is now recognized by them as the standard method of operation."

"The steam roads, however, with their ultra-conserva-

tism, were loath to part with the long established telegraph, and, while a little experimenting has been done from time to time in a very small way, it is only recently that the use of the telephone for this purpose has been attempted on a sufficiently large scale to secure a fair demonstration of its possibilities. The immediate incentive for these experiments was the near approach of the date for the enforcement of the federal nine-hour law, coupled with the well defined shortage of telegraph operators that had existed for two or three years."

"The first experiment on the Burlington road, in handling trains exclusively by telephone, was begun on the 11th of last December, on the portion of our main line between Aurora and Mendota, Ill., a distance of 46 miles. Eleven offices were cut in on this circuit. The result was so satisfactory that the construction of another circuit from Aurora to Galesburg, 125 miles, with sixteen offices, to handle the dispatching between Mendota and Galesburg, was immediately authorized. This circuit was completed January 24, 1908, and has been in use regularly since that date. On March 1 the third telephone circuit was completed. This extends from Clyde, the end of the Chicago terminals, to Aurora, a distance of 28 miles, with fifteen offices. These three circuits are all on double track. On March 19, the first installation on single track was completed between Aurora and Savanna, a distance of 106 miles, with twenty-three offices."

"Up to this time, while many who personally investigated the matter were willing to concede the efficiency of the telephonic system as applied to double-track operation, they were very skeptical as to what would be the result on single track. In this distrust, they overlooked the fact that in our method of double-track operation,

the irregularity of reverse movements in reality made the requirements on such lines more exacting than on single track, where opposing movements were perforce the regular method of operation. The results of this last installation were even more marked than on double track, and I am convinced that the handling of trains by telephone is not only much more satisfactory, but is really safer as well, and this opinion is shared by all who have personally looked into the matter."

"Believing that the best was none too good for a train wire, we have in each case, with the exception of the Clyde-Aurora circuit, strung two 210-lb. copper wires and have made the installation as complete and perfect as we know how. With the present market price of copper, the telephone circuit costs approximately $100 a mile and the station equipment about $50 per station. This is more expensive than the telegraph circuit, and the maintenance will be a little more difficult and the cost a little higher, but the results have proved so absolutely satisfactory that we feel the additional expense to be fully warranted."

"Our arrangement makes the circuit entirely self-contained; that is, the signaling and talking is all done on the same pair of wires. The signaling is done by semi-automatic selectors that enable the dispatcher merely by the depression of a couple of buttons in connection with a series of synchronous clocks to ring at will vibrating bells in one or more offices on the circuit. This is a much less laborious method of calling, and we also find a very great saving in time, the operators responding very much more quickly than is the practice with the telegraph. In the local offices we put a four-inch vibrating bell, one large enough to be heard at a considerable distance, and

when this bell lets go without any preliminary warning, the one thought of the operator is to shut it off, and so he immediately answers the call. More often than otherwise the operators, to avoid the annoyance of the signal bell, forestall the dispatcher's call and report trains as soon as they pass."

"In handling orders, the same general methods are observed as with the telegraph, any figures or names of stations occurring in the order being spelled out letter by letter, both in the giving of the order and all of the repetitions, and the name of the conductor on a "31" order is spelled out as well."

"The use of the telephone is so rapid in every way, and so much more flexible than the telegraph, that the dispatcher is enabled to get far more detailed information of exactly what each train is doing, even, when occasion requires, talking directly with the conductor or engineer personally. He is thus brought just so much nearer the actual details of train movement. Only a personal investigation of the scheme can show how valuable is this information."

"There has also been a marked improvement in the work of the men on these telephone circuits, due to the fact that the conversations between the dispatcher and the operators or other employes are of a much more personal character than can be carried on with the telegraph, resulting in much closer co-operation. It is even possible to save considerable time in the actual putting out of orders. The dispatcher copies the order in his order book as he speaks it, thus gaging, or rather reducing, his speed of conversation to his ability to write it down, as well as the ability of the operators to do so. Then, when the operators repeat the order, they read it off as fast as

they can, much more rapidly than is possible by telegraph."

"The change in method in every case was made without a hitch, and without any opposition worth mentioning. I had an idea that, while possibly the dispatchers themselves might not openly oppose the change, their support might be of a passive character, but in this I was agreeably disappointed. The first circuit had not been in operation a week before a little spirit of jealousy was evidenced, directed against the dispatchers on the telephone circuit, it being so clearly evident they had the "snap" of the office. Soon all the dispatchers in Aurora were desirous that we give them the same facilities, and now that all have been taken care of, there is not one out of the twelve who would willingly go back to the old method of train dispatching by telegraph."

"It is far more easy to train telephone operators than to secure telegraphers. There is hardly a town anywhere on the line in which there are not young fellows, who, having spent some time at the station, are more or less familiar with railroad work, and who, with a very little training, would be perfectly competent to do the work of telephone operators. There is much to be gained by making use of men in their own home towns, or who have grown up along the line. Our telegraph service was at its best when this condition existed to a considerable extent, and discipline has lessened in proportion as we have been compelled to import telegraph talent. This increased use of the telephone has also opened an avenue whereby we can offer better employment to those unfortunately injured in our service, few of whom in the past have been able to learn telegraphy."

"Another item worthy of consideration is the broad-

ened field from which we can make dispatchers. In the past, the first requisite for a dispatcher was an ability to telegraph, and with the character and ability of telegraphers dropping as fast as it has during the past two or three years, we are inclined to expect difficulty in the future in getting satisfactory talent, even if this difficulty has not been greatly in evidence in the past. I maintain that a good, bright, young freight conductor, who has been actually carrying out the train orders, would make a better dispatcher himself and be better able to assist in getting other trains over the road than is the telegraph dispatcher, who, in spite of his occasional trips on freight trains is, after all, a theorist."

"The establishment of telephone circuits enables us to close unimportant offices wholly or a portion of the time, as a telephone instrument can be placed where the train conductors can readily get in touch with the dispatcher, and report their trains into clear or get help if necessary."

"Another important feature in the use of the telephone is that it works even bettèr in bad weather than in good—just the reverse of the telegraph—and if there is ever a time when good service is needed, it is when the weather is wet and foggy. There is no exasperating interference with the dispatcher's efforts by reason of the relay in some way office being out of adjustment and the inattentive operator making no effort to see whether this is the case or not. The telephone is always in proper adjustment, and because of the lowered static capacity of the circuits works as if charmed."

"With the telephone it is possible to arrange apparatus, for instance, in the superintendent's office, so that he can at any time listen to the actual work of the dispatch-

ers and operators and thus check up any tendency to slackness. This has not always been possible in the past, as not all superintendents were telegraphers.

"The improvement in the handling of train dispatching by telephone has been so clearly demonstrated that we have decided to attempt to handle other messages in like manner, and in a short time all business for the way offices on certain portions of our line (both main and branches) will be handled by telephone, this to include Western Union business as well. At junction points where branch telegraph lines are to be worked and at certain wire test offices, it may be necessary to maintain telegraph service, but at all other points all classes of business will be handled by telephone."

"The field for substituting the telephone for the telegraph daily opens up before us almost faster than we can comprehend it, and the results we are obtaining from our experiments are a constant but very agreeable surprise. For instance, only about a month ago it seemed next to impossible to get satisfactory telephone service on single wire branch lines without completing the metallic circuit, and this the volume of business did not warrant. However, within the last few days we have made successful substitution on two branch lines, one 18 miles long and three offices, and the other 49 miles long with ten offices. These branch wires have been so arranged that while not connected permanently with the main line, they can be connected automatically at the will of the dispatcher or the way office operator, the signaling on the branch being done by means of ordinary bridged bells."

"The unqualified success of our experiments with the telephone as a substitute for the telegraph, and the rapid-

ity with which other roads are extending the work, convinces me that the next few months will make a great change in methods of handling trains all over the country, and one that will greatly benefit the service."

Train Dispatcher's Desk, Showing Selective Signaling Devices and Telephone Sets.

TRAIN DISPATCHING BY TELEPHONE.

When the use of the telephone for handling trains shall have become universal a new era in railway history will have begun.

The telegraph was a long stride in the right direction. But, to quote the language of a prominent railway official: "Since what can be done with the telephone has

been fully demonstrated. I marvel that we placed such implicit faith in the telegraph for so long a time."

Not only does the telephone render possible the faster, surer and safer handling of trains; but it provides direct communication between the dispatcher and his train or enginemen without any go-between. It also makes provisions for the handling, by experts, of such track blockades as may occur, much more rapidly, and with a world more of satisfaction, than can be had with the telegraph.

It has been readily conceded by everyone that the telephone system using ordinary bells and a system of code ringing is out of the question on a line carrying from fifteen to fifty stations. The continuous ringing of bells would be a serious obstacle to the proper reception of signals and would render careless the operators in charge with the result that it would be as difficult to "raise" operators by the telephone as it has been found to be by telegraph. The use of selective signalling overcomes this difficulty entirely and by the use of a loud ringing bell at the way station secures immediate attention of the operator in charge, if he be within hearing distance, which may be two or three hundred feet from the office. So great an advantage has this proven to be that not only have the calls been reduced to a minimum, but the general efficiency of the service has been materially increased.

There are a number of systems of selective signalling which work satisfactorily for a few stations and there are several systems which have been designed for a considerable number of stations and work to some degree of satisfaction when the line conditions are perfect. The principal defect with these systems is the method of signalling which in most cases is a "step-by-step" method, which is not only slow but uncertain. In stormy weather the

Fig. 14.

electrical discharges break up the chain of signals and consequently it is extremely difficult to reach the desired station. The dispatcher must find an interval of time between lightning flashes sufficiently long for him to operate his "step-by-step" signals, and on a line of considerable length this is no easy matter, as it requires but a very small discharge to place an additional "step" in the signal and as a result the wrong party is called.

With the system which has been adopted by the Burlington Railroad the dispatcher can call any or all stations with a single operation, while with other systems it is necessary for the dispatcher to go through as many operations as there are stations to be called.

The system of selective signalling is of the synchronous type and uses for its synchronous mechanisms standard lever escapement clock movements. On the dispatcher's selector is a dial having fifty-six contact points, each of which may represent a way station, while in a twenty-eight station system the points diametrically opposite are wired in parallel. A brush is arranged to pass over these points on the dial, completing a circuit in series with each station key that has been operated, thus causing current to flow out on the line during the interval of time in which the brush is passing over such points. (Fig. 15.)

The selector keys are arranged in a row in front of the dispatcher, one key being required for each station. Below this row of keys are two other keys, one for starting the clock movements and one for releasing any selector key. This last mentioned key is for the convenience of the dispatcher in releasing any selector key he has operated by mistake and is used only for this purpose, as all keys are automatically released after the party has been called. The arrangement of the keys is shown in the accompanying illustration. (Fig. 14.)

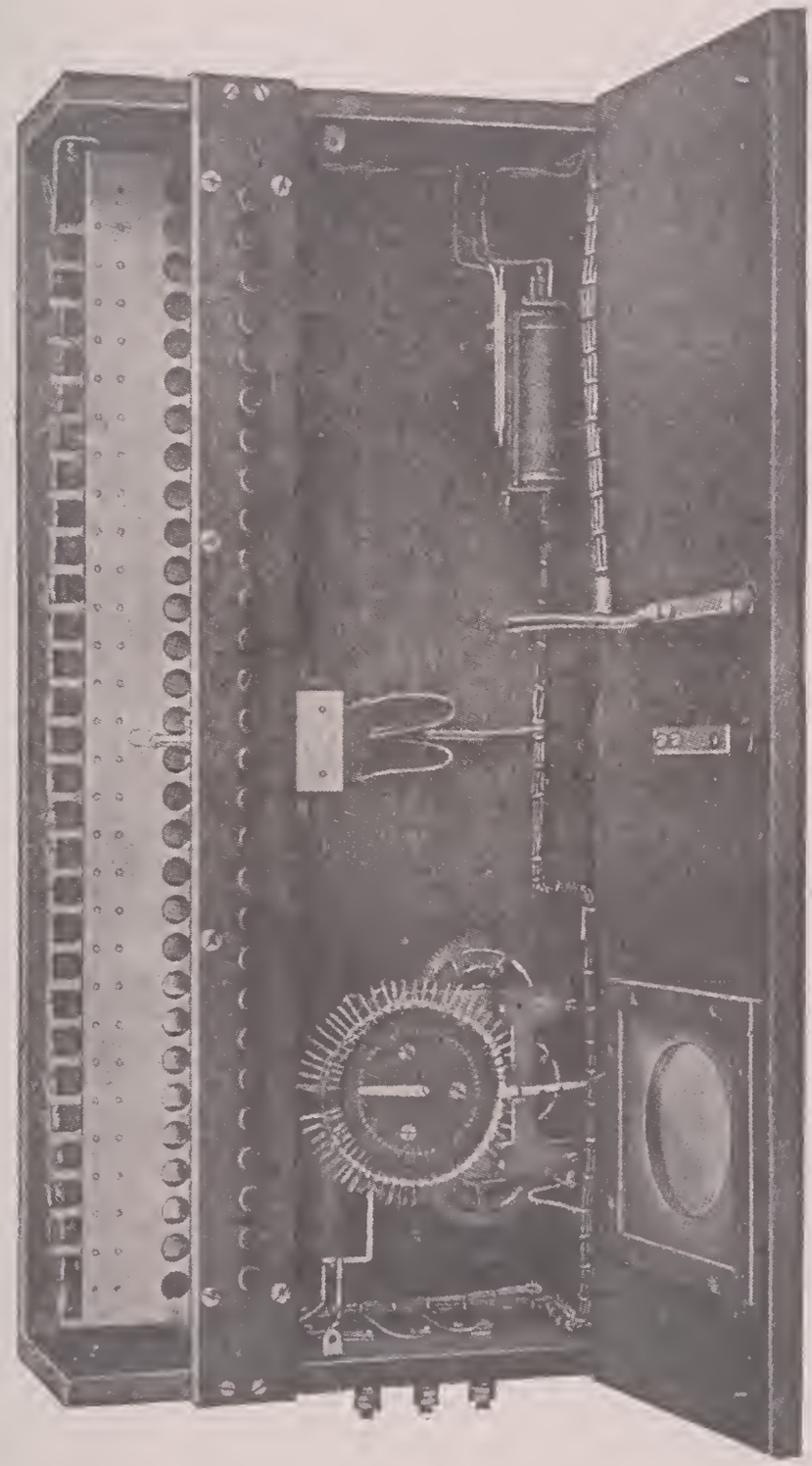


Fig. 15.

The clock mechanism at each way station is equipped with a small commutator having two contacts located diametrically opposite for the twenty-eight station system, while one contact only is required for the fifty-six station system. This commutator revolves as the second hand of

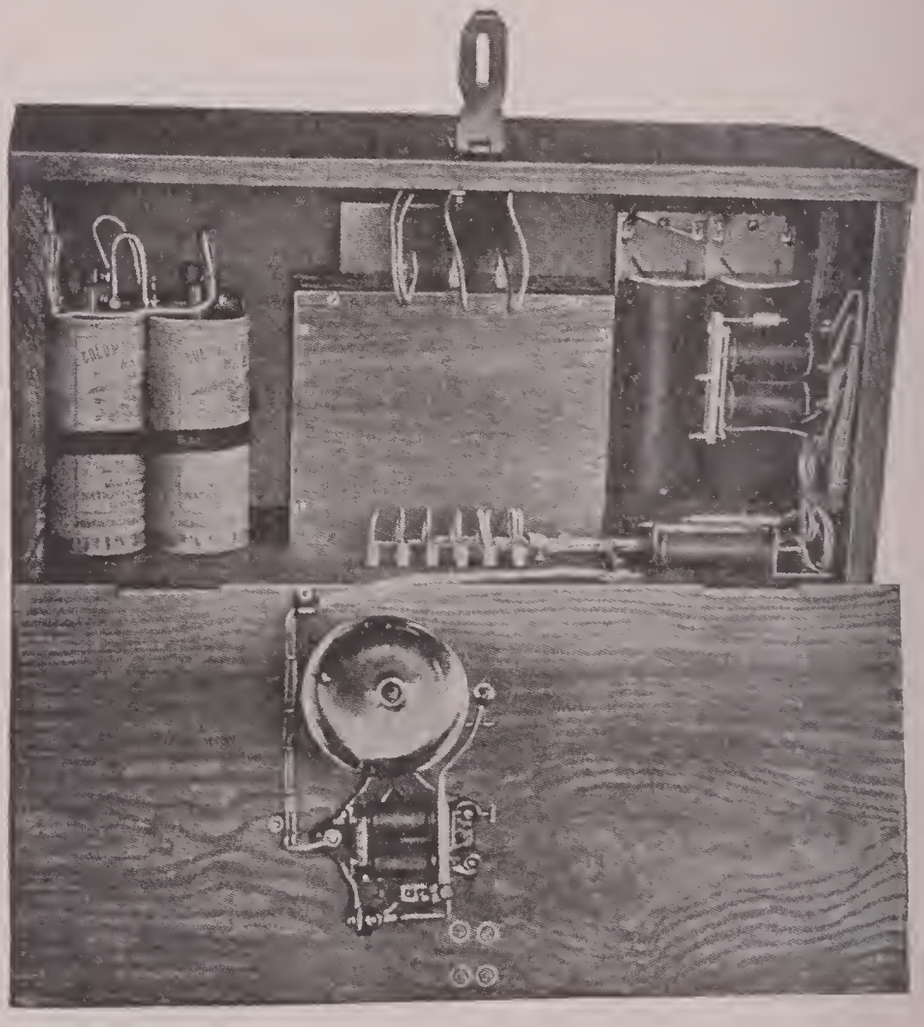


Fig. 16.

a clock and as it brings the contact point under the brush a circuit is completed through a relay, provided the dispatcher has operated the key associated with this particular station. This relay is so wired that when once energized it remains in the operated position until released by the station agent in charge. The operation of

Fig. 17.

the relay completes the bell circuit, which is entirely independent of the line. The bell used in this circuit is of the vibrating type, is provided with a four-inch gong and has sufficient power to be heard for a long distance. (Fig. 18.)

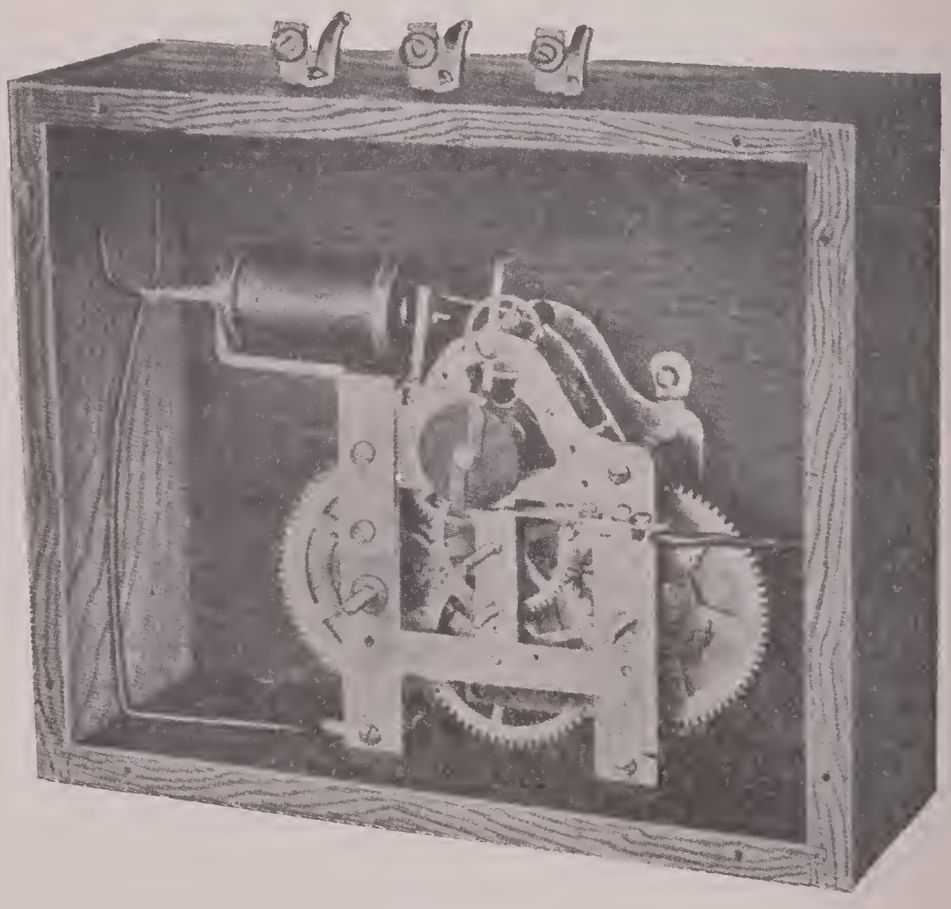


Fig. 18.

Example.—The dispatcher desires to speak with the agent at way station No. 71. He first operates key No. 7 and then presses the starting key which releases all the clock movements in the system, and as the brush passes over contact No. 7 on the dial at the dispatcher's office, the selector at station No. 7 has caused its commutator to revolve so that the contact point has come under the brush; thus the two selectors together complete the necessary circuits at the same instant and conse-

quently the relay is operated, cutting the bell into circuit. This will continue to ring until the attendant answers. Should the dispatcher want a group or even all the station agents on the line at one time he operates such station keys as he desires, presses the starting button and each bell starts to ring in turn as the selector brush passes over the different contact points on the dial.

DISPATCHER'S OFFICE EQUIPMENT.

The equipment for the dispatcher's station consists of (Fig. 19) telephone talking apparatus, together with the necessary apparatus for signalling the various stations along the line. The selector equipment, which consists of the master selector, the selector keys, starting key and the releasing key, magnet and relay are all contained in a neat oak cabinet, which can be placed on the dispatcher's table. (Figs 14 and 15.)

The selector keys are arranged in a row across the front of the box and above each key is placed a small holder in which designation cards with the name of the associated station or any other information can be inserted.

Fig. 15 is a view of the cabinet with the hinged front opened, the top and front strip above the keys removed to expose the working parts. This view gives a good idea of the equipment arrangement.

The dispatcher is provided with a breast plate transmitter and head band receiver (Fig. 19), so as to permit the free use of his hands for writing, operating the selector or any other work he may have. He is expected to have his receiver on his head at all times, when on duty. A transmitter cut-out key is provided, inclosed in a suit-

able box for mounting in a convenient location on the dispatcher's desk. (Fig. 20.) This key is for the use

Fig. 19.

of the dispatcher in cutting out his transmitter circuit while receiving, thus eliminating any noises that his transmitter might pick up.

If for any reason the dispatcher takes his receiver from his head he can be signalled, as a hand generator is furnished at each sub-station and a bell is bridged across the two line wires at the dispatcher's desk. In Fig. 21 this bell is shown.

Fig. 20.

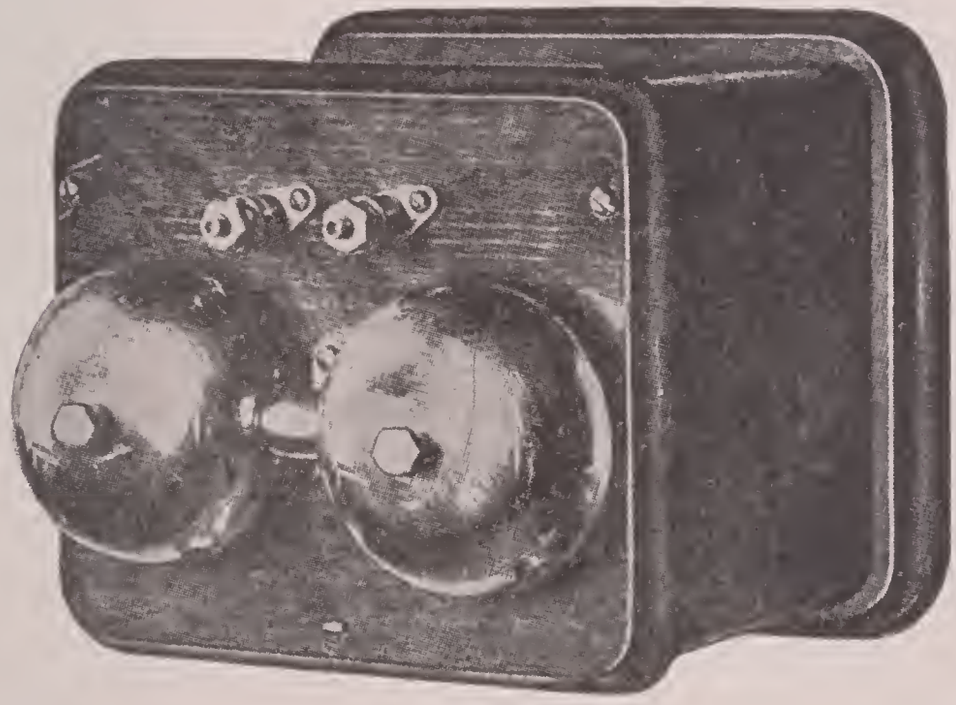


Fig. 21.

The battery equipment necessary at the dispatcher's office consists of 3 sets of cells: The talking battery consisting of five Edison cells (3.5 volts), the battery for

operating the various relays and magnets comprised of ten Edison cells (7 volts), and the battery for signalling the sub-stations consisting of a sufficient number of dry cells to produce from 100 to 200 volts, depending on the length of the line and the number of stations.

The line in entering the office should pass through fuses and carbon lightning arrester so as to protect the station equipment.

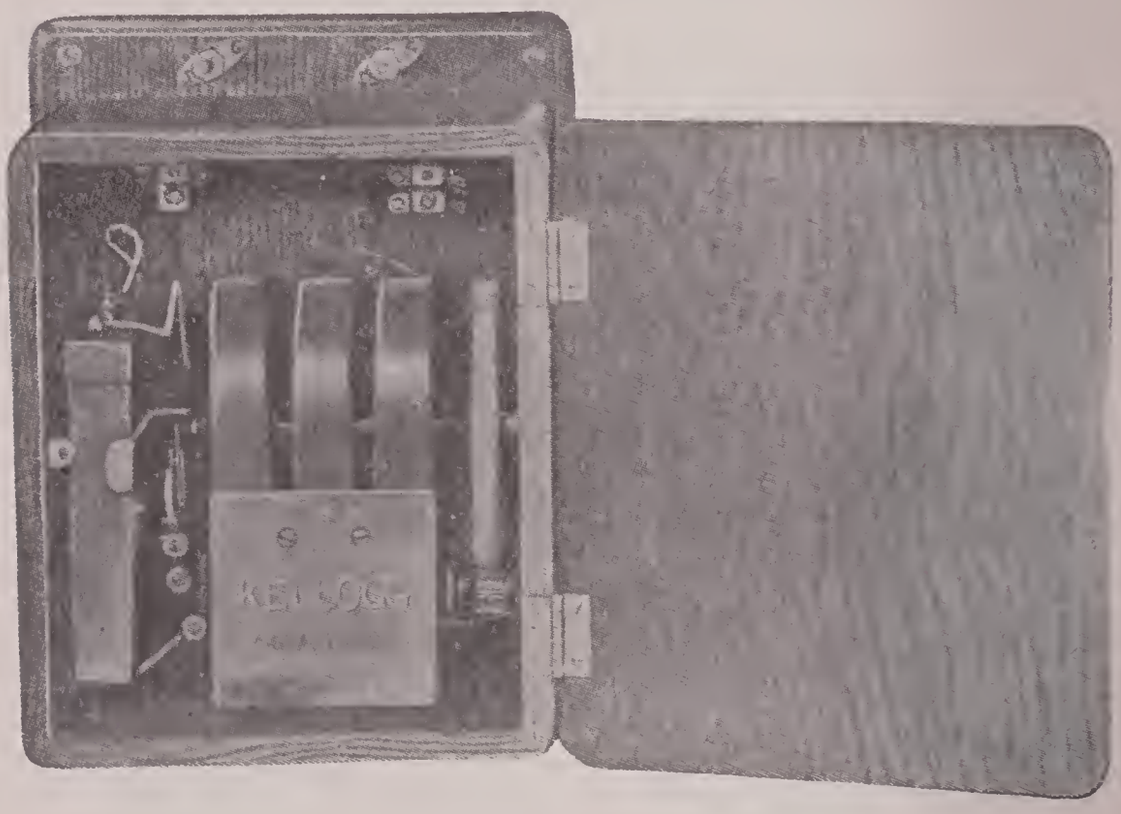


Fig. 22.

SUB-STATION EQUIPMENT.

The equipment required at the different sub-stations is even less complicated than that required at the dispatcher's station. The apparatus for receiving the signals from the dispatcher's office consisting of the selector, relays, bell, retardation coils, condenser and dry battery,

are mounted in a substantial box. (See Figs. 16 and 17.) This box is so arranged as to be locked to prevent anyone from tampering with the signalling equipment. It may be installed under the desk or any out of the way place.

The sub-station selector is contained in a small wooden box with screw terminals on the outside for connecting with the rest of the apparatus.

Four dry cells are used to operate the bell, bell relay and selector starting magnet.

The telephone equipment consists of an oak desk set box, containing the hand generator, induction coil and condenser (Fig. 22), and the "Flexiphone," consisting of a transmitter, head receiver, hookswitch and an adjustable arm. (See Fig. 23.) The desk set box should be mounted in a convenient place on the end of the desk or a nearby wall so that the station agent can readily reach the generator crank for signalling the dispatcher if occasion requires.

The Flexiphone can be mounted on the end or the top of desk or on the wall, as is most convenient. The arm permits its being put in any desired position, either horizontal or vertical, and it remains in the position last placed without being held. With the use of the head receiver this type of telephone permits of the free use of both bands, which is of advantage in taking train orders or doing other work while carrying on a conversation. If the standard type of desk telephone is desired the same will be furnished.

For the use of the trainmen there is a telephone which can be installed in a waiting room. This set is placed in a strong box locked to prevent any but authorized persons from using the same. When a trainman desires to get train orders he opens the box which automatically

connects the 'phone to the line and then speaks to the dispatcher. This telephone is of especial advantage at stations which are closed for a portion of each day, as it enables the dispatcher to make meeting points for trains.

Fig. 23.

The foregoing is a description in general terms, of the system of telephonic train dispatching as installed upon

the Burlington. The following comparative detailed description of the operation of two styles of selective alarms, one on the Burlington, as already described, the other on the New York Central, as well as details of the various uses a railway may make of the telephone for expediting its business, will doubtless prove instructive.

In describing the tests on the New York Central, the writer* states that after several months' use on a busy main line division, it was never necessary to have recourse to the telegraph, not even when there was trouble on the telephone circuit. He further says:

"The line used is a metallic circuit of 210-lb. copper wire and connection is established with sixteen stations along the section. Special signalling devices are used on this circuit, which enable the dispatcher, located at Albany, to call any one station without calling the others, or while talking to one station he may call another without interfering with the conversation. These selectors are operated by a relay of low impedance connected in series with the line, and are arranged to close a local bell circuit when operated by a combination of electrical impulses sent out over the circuit by the dispatcher. The dispatcher is furnished with a set of automatic calling keys, one for each station on the line, so arranged that the proper combination of impulses will be sent out over the line to operate the various selectors.

"The selecting current, supplied by a grounded battery located at the dispatcher's office, is applied to the neutral point of a bridged impedance coil, and the current is completed to ground at the distance end of the line through another impedance coil similarly connected. In

*Extracts from a copyrighted paper by W. E. Harkness, read before the New York Telephone Society.

this way stations can be called while a conversation is being held on the line without interference from the signaling current impulses.

"Further, as has been demonstrated in practice, the stations on one side of the circuit may be signaled in case one side of the line should open, and conversation can even be carried on with the stations with the line in this condition.

"This illustrates one of the great advantages of the telephone over the telegraph—namely, that even though the line may be in trouble, conversation can be carried on over a line which, if used for telegraph, would be entirely out of service.

"The selection of any station is done in about eight seconds, and the local bell circuit closed by the selector remains closed until the operator answers the call by closing a key. The arrangements are such that the dispatcher receives an automatic answer-back signal from the station called. This signal is given by the bell at the station, so that if the answer back is received by the dispatcher there can be no question as to the ringing of the bell at the station.

"The dispatcher is equipped with a chest transmitter and a head telephone. The transmitter circuit is normally open, and his receiver is bridged across the line at all times. In this way he can be reached simultaneously by any operator coming in on the line. A key for closing the transmitter circuit is provided and also one to connect a howler signaling circuit to the line, this latter being used when stations fails to disconnect their sets from the line after finishing their conversation.

"The stations are equipped with special telephone sets, consisting of a special desk arm, to which is secured a

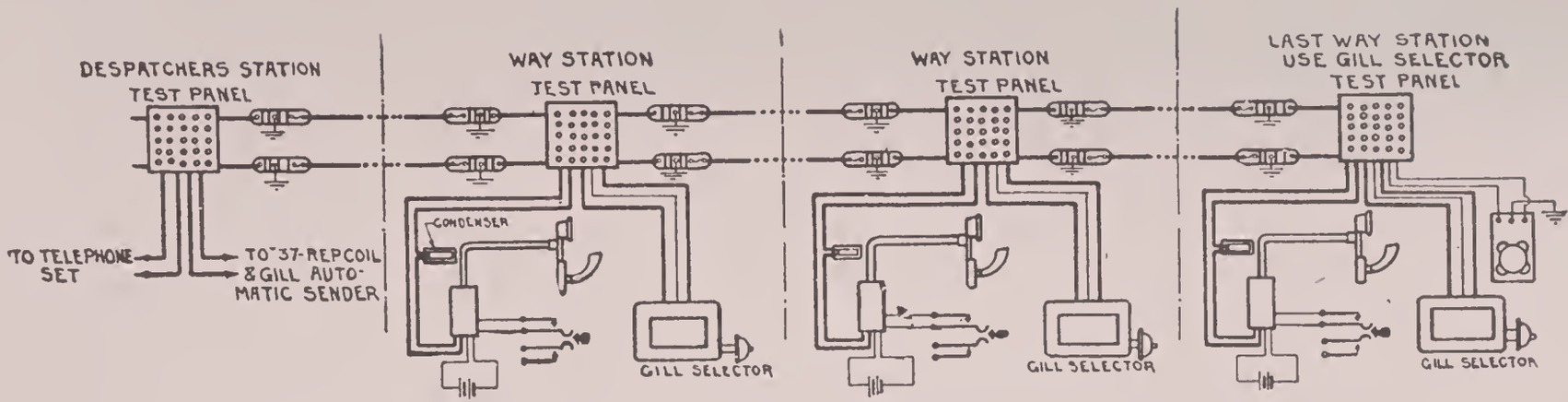
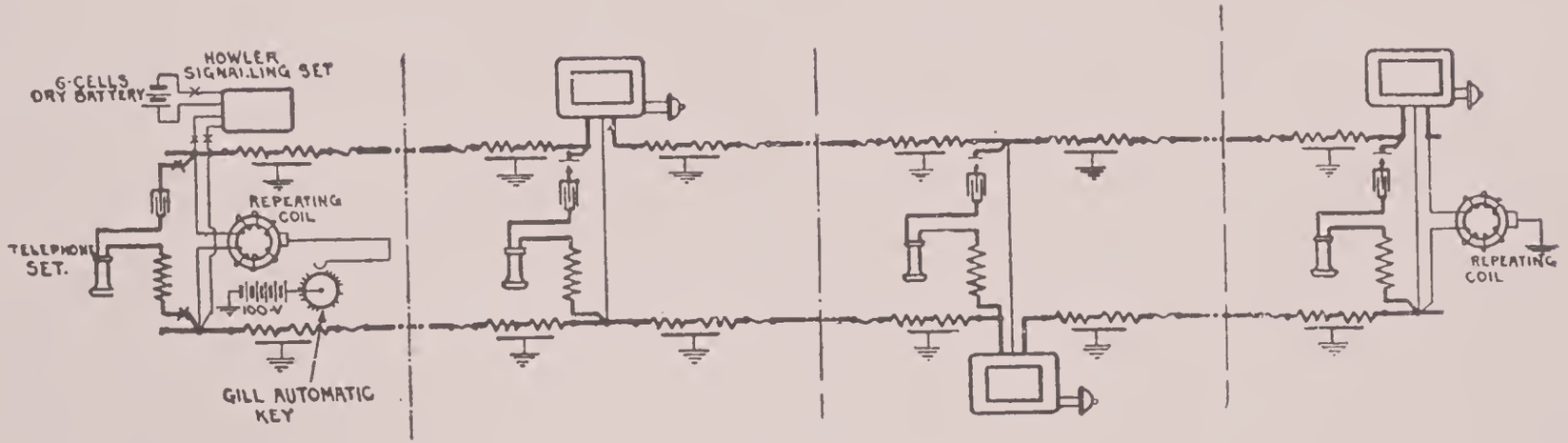


Diagram Indicating Method of Cutting Stations into Telephone Circuit for Dispatcher's Use.



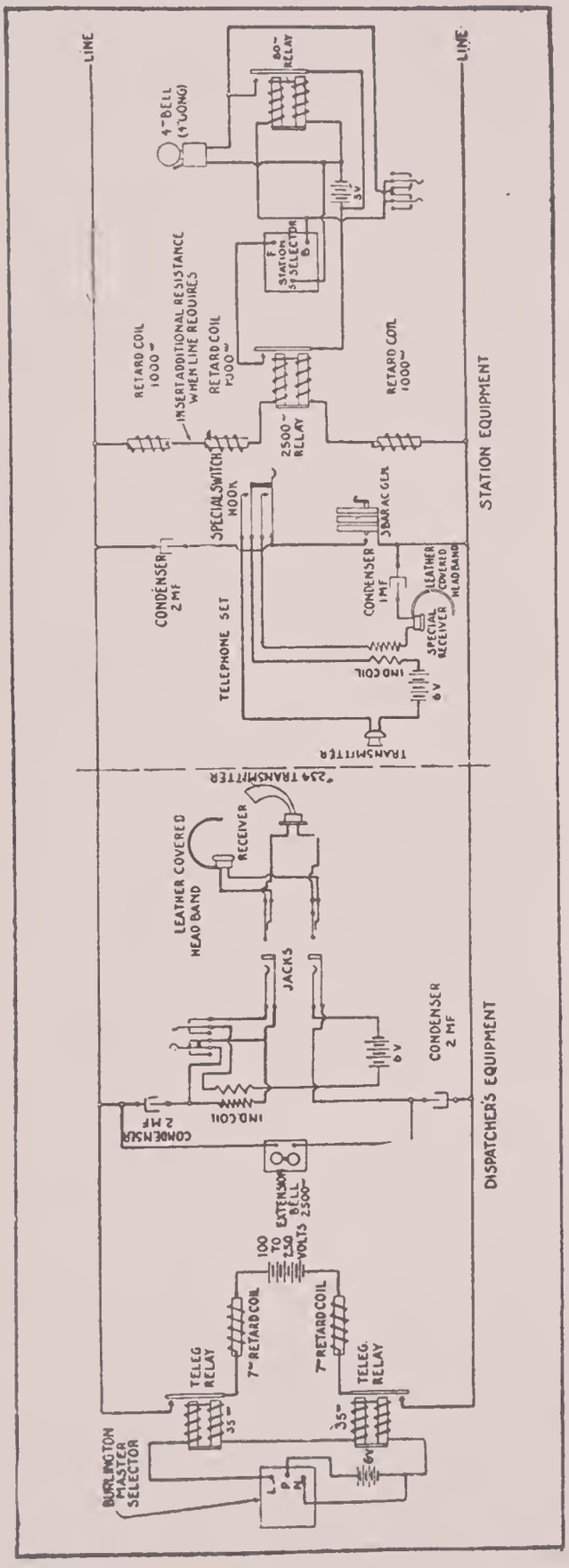
Simplified Telephone Circuit for Dispatcher's Use, Extending Through Several Way Stations. Type Used on New York Central Lines.

special hand set, somewhat similar to the one used by telephone linemen, together with the usual induction coil and batteries. A key for closing the transmitter circuit is also provided. The special equipment was necessary, owing to the fact that the operators in the stations were obliged to attend to the switches and signals, and, to do this properly, should not be obliged to have to bother with a head telephone; further, by having the relative positions of the transmitter and receiver fixed, it was believed that better transmission would be obtained, as the operator is obliged to hold his ear to the receiver to receive his orders, and when in this position he has the transmitter directly in front of him. In issuing orders over this circuit the general rules governing the movement of trains previously given are followed.

Automatic Answer-Back for Telegraph Station.

Fig. 24.

"The dispatcher calls the various stations desired by operating the automatic keys, and as each man answers his call he is told to prepare to take an order. The order is then given by the dispatcher, word by word, and written out by the operators. The dispatcher writes the order, word for word, as he issues it to the operators, and in this way prevents too rapid dictation and ensures



Dispatcher's Telephone Circuit of the Type Used on the Burlington System.

the accuracy of his own record. It is then repeated back by each operator, and as each word is repeated back the dispatcher underscores it in his book. The underscoring is done each time the order is repeated by the different operators, so that if the order is issued to three operators and properly repeated by them each word in the dispatcher's book will be underscored three times.

"It may be well at this point to state that the check on telegraphic train orders is usually done by an operator other than the dispatcher, who copies all the orders as given by the dispatcher and repeated by each operator.

"The New York Central equipment has been subject to careful observation by the operating officials of the road, and it has been found that the trains on the division operated by telephone have been handled with safety, and, in addition, with greater speed than when operated by telegraph. In fact, it has been found that the dispatcher operating this circuit is busy about 55 per cent. of his time, while the other dispatchers handling the same trains on the remaining sections of the same division are kept busy all of the time. This, however, is not the greatest advantage of the system. It has been found that the dispatchers and operators are in closer touch with each other on the telephone circuit and assume more personal relations, and, due to this, more detailed information regarding the movement of trains is transmitted when conversing by telephone than was possible by telegraph. The number of small matters which are called to the attention of the dispatcher affecting the movement of trains can be taken care of instantaneously and instructions issued as quickly as the information is received. If necessary, the conductor of the train or the engineman can be called to the telephone and the details

of existing conditions received at first hand rather than through an operator. It further permits the superintendent of the division, or higher officials, to talk with the man on the ground in case of accident or unusual delay, and issue instructions, if necessary. The telephone circuit has been found to operate under all conditions of weather which ordinarily would interfere with the operation of a telegraph circuit.

"The amount of money which it is possible to save in this way cannot be estimated, but it is greatly in excess of the cost of the telephone line and equipment necessary to accomplish these results.

"The Chicago, Burlington & Quincy Railway installed the telephone for despatching service on its main line between Aurora and Mendota, a distance of 37 miles, and between Aurora and Savannah, a distance of 108 miles—in all about 191 miles.

"The method of wording and issuing the orders on these circuits is practically the same as that used on the New York Central, but the method of selective signaling and the apparatus used are quite different.

"Each station is equipped with a special transmitter arm and head telephone with the necessary induction coil and batteries. A high resistance and high impedance relay is bridged across the line at each station. A selective device, consisting of a clockwork on which is mounted a commutator having two narrow segments, diametrically opposite each other, is also located at the station.

"These segments are connected together and form part of the circuit of a locking relay, controlling the signal bell. The circuit of this locking relay is completed through a brush resting on the surface of the commutator, which momentarily makes contact with one of the

segments during each half revolution of the commutator, and also the contacts of the bridged line relay. The clockwork is prevented from running continuously by a stop, which is electrically controlled. The stop, or starting relay as it may be called, is controlled by the relay bridged across the telephone circuit, and is operated when an impulse of current is sent out over the line by the dispatcher.

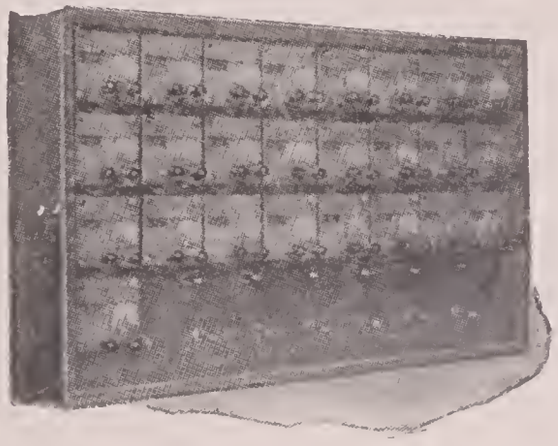
"The mechanical arrangements are such that after the clockwork has been released and starts to run, the commutator is permitted to make a half revolution, the continued operation being prevented by a mechanical stop, and the mechanism is again ready for the next call. By this arrangement the direction of rotation of the commutator is always the same, no reversal being necessary to restore it to normal. The half revolution of the commutator is completed in 30 seconds, and, by locating the segments on the commutators at the various stations at different points on the circumference, it is possible to have the local circuit of the various stations closed in successive order, or according to any pre-arranged plan.

"At the dispatcher's office is installed a master clock, which differs from those at the stations, in that its commutator contains 30 segments on each half, or a total of 60, the ones diametrically opposite being connected in multiple. This commutator is stationary, and contact is established with the segments by means of a revolving brush. The motion of this brush is controlled in the same manner as the commutators at the stations and during a half revolution it makes contact consecutively with each of the 30 segments on the commutator, and then comes to rest and is ready for the next call.

"Each of the thirty segments on the commutator of the

master clock is connected to one contact of an individual key, the other contact of the key being connected to the winding of a local relay, its circuit being completed through the brush of the master clock. When operated, this relay sends an electrical impulse out over the telephone line.

"From this it will be seen that thirty individual keys are provided, one for each station. These keys, when depressed, are mechanically locked, and are arranged so that when the master clock comes to rest after making a call, all of the keys which have been locked are released and restored to normal.



Train Despatcher's Automatic Sending Device—Capacity 32 Stations—Equipped for 25, 7 blanks.

Fig. 25.

"The dispatcher is also furnished with a starting key, which, when depressed, sends an impulse of current out over the telephone line, and starts the master clock and all of the station clocks, which continue to run for 30 seconds, being then stopped mechanically, as previously mentioned.

"To signal or select a station, the dispatcher depresses the individual key associated with the particular station

desired, and then starts the clocks by pressing the starting key. As the brush on the master clock passes over the segments on the commutator, and when in contact with the one connected to the station key which has been depressed, it completes the circuit of the local relay, sending a second impulse of current out over the line. At the instant this second impulse of current is applied to the line, the brush and segment of the particular station desired are in contact, and the locking relay controlling the signal bell being operated by the bridged-line relay causes the bell to ring, which continues until the relay is released by the station operator pressing a key.

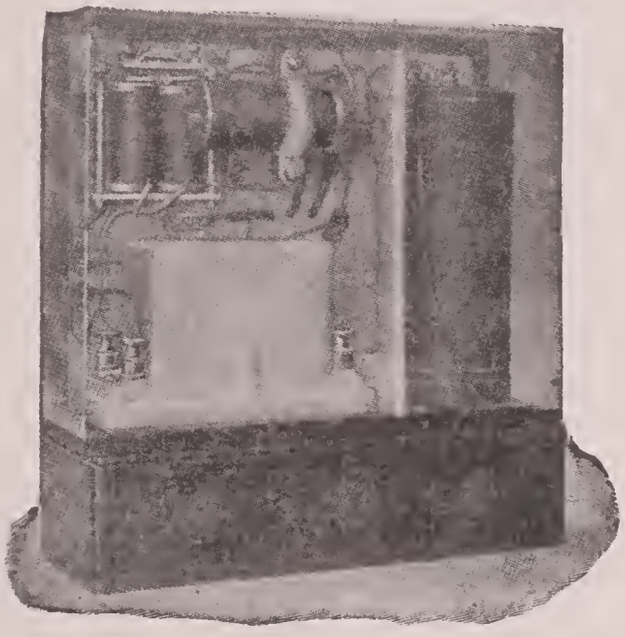
"No 'answer-back' signal is given to the dispatcher, so that he is unable to tell whether or not the signal has been received until the operator answers.

"This arrangement permits of more than one station being called at the same time; in fact it is possible to call all of the stations, if so desired, in the 30 seconds. The average time for an equipment of thirty stations would be 15 seconds, which is greater than that of the system used by the New York Central; and, further, while some stations can be called in 3 or 4 seconds, it will require 26 or 28 seconds to call others.

"The great advantage which is claimed for the system used by the Burlington, is the calling arrangement, which permits one or all of the stations being called in one operation by the dispatcher. It is believed, however, that this is not as important as one would imagine, as it is seldom necessary to call all of the stations, three or four being the usual number, and as it takes from 1 to 5 minutes to raise a single station by telegraph, and since, with a selective device, it is possible to call, say, three stations in 24 seconds, it is so great an improve-

ment over the old method that a further gain of 4 or more seconds is not of any great importance.

"The multiple calling has a further disadvantage in that two or more operators are liable to come in on the circuit at the same time, and break in on the conversation and cause confusion similar to that produced by telephone operators breaking in on a call circuit; in straightening out a situation of this kind, more time is lost than is gained by calling several stations at the same time.



lector Box with Answer-Back for Telephone Station.

Fig. 26.

"The New York Central system, taking 8 seconds for calling each station, permits the dispatcher to call one station, and while instructing the operator at the first station to prepare to take an order, calls the second station, and while instructing the second operator, call the third, the whole transaction taking about 24 seconds without confusion.

"So far, all of the telephone apparatus furnished for

dispatching purposes has been special, and the indications are that this will continue for some time to come, as each railway official has ideas of his own which he naturally thinks are the best, and which he will insist on trying.

"In addition to the roads mentioned above as actually despatching by telephone, the many other large roads are installing telephone despatching systems, and expect eventually to operate by this system exclusively.

BLOCK-SIGNAL TELEPHONES.

"A further use of the telephone in connection with the movement of trains is with the operation of block signals. The usual method of communication between block-signal towers is by means of telegraph or bell signals. Some roads are using the telephone for this purpose, and have found it superior to either the telegraph or bell signals, as it enables more detailed information to be passed between the adjacent towers and movements of trains effected, which was not possible under the old systems. In this way the handling of traffic is facilitated and the operating expense caused by delayed trains reduced.

"Of the various railroads, approximately 100 are using block signals, and of these 77 are using the telegraph, 16 the telephone and 10 bell signals. About 8 per cent. of the trackage operated is handled by telephones, 2 per cent. by bell signals, and the remaining 90 per cent. by telegraph. The largest user of the telephone for this purpose is the Atchison, Topeka & Santa Fé, which operates its 1,800 miles of track by telephone exclusively. The Burlington is operating some 1,100 miles, and the Illinois Central about 800 miles of track in the same way."

SIDING TELEPHONES.

"On many of the Western roads there are sidings located at some distance from the regular stations, and in some cases between stations, where trains must await the passing of other trains. Telephones are located at these sidings in booths or boxes on the poles, and the train crews report their arrival and the passing of other trains to the nearest station and receive instructions governing their movements. This arrangement does away with the opening of many telegraph offices which would otherwise be necessary. Some railroads equip their trains with portable telephone sets, which may be used for this purpose or in cases of accident. In this case connection is established with one of the telephone or composited telegraph lines and the nearest station called."

TELEPHONES FOR CALLING TRAIN CREWS.

"At large terminals or division headquarters where freight trains are made up, it is necessary to notify the train crews when to report for duty. The usual method of doing this is to send a boy to the residence of each member of the train crew as soon as the leaving time of the train is determined, so as to have them ready to take out the train. The delays to trains occasioned by failure to get this information to the crews promptly occasion a large loss to the railroads, as it frequently happens that some of the members of the crew are found to be sick or cannot be located, and other men must be sent for. To overcome this difficulty, some of the roads are installing telephones in the residences of their crews,

and are calling them by telephone instead of by messenger, in this way getting prompt replies as to whether they can report, and, if not, another man can be quickly called to take the place of the first and thus get the train out on time. A further saving in the labor expense is thus made, as these crews are usually paid by the hour when delays occur."

"At Altoona, Pa.—one of the largest division points of the Pennsylvania Railroad—525 telephones have been installed by the railroad company in the residences of their employees for this purpose. These sets are connected four on a line, and are handled by one operator at the private branch exchange where the lines terminate. This installation does the work of fifteen call boys, and has been found more satisfactory in every way, including greater economy."

TELEPHONE SERVICE FOR ROUNDHOUSES.

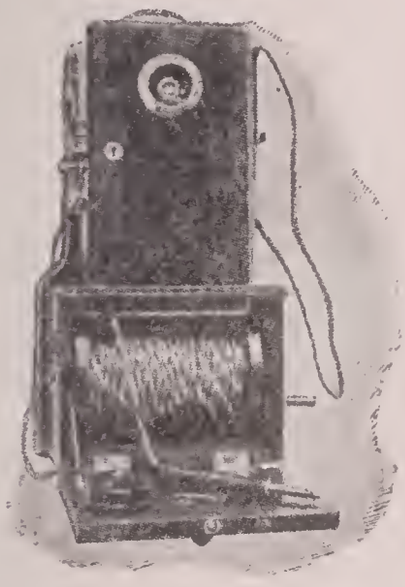
"In making up trains it is necessary to provide for notice being given to the motive power department to prepare the necessary locomotives, and when the trains are made up, to send them from the roundhouse to the freight yard or passenger station. This, in many cases, is being done by telephone in place of by telegraph."

WRECKING-TRAIN SERVICE.

"In case of a wreck occurring on a railroad, it is necessary to send out the wrecking train at the earliest possible moment, and to do this the special crew for this train must be assembled quickly. Some roads have con-

structed special lines to the residences of these crews for this purpose exclusively, and in this way are able to assemble a crew and start a train very quickly.

"Portable telephone sets are furnished the wrecking trains, so that connection may be established with telephone circuits along the line, or, if these are not available, with composited telegraph lines, and in this way keep the officials informed as to conditions and receive instructions."



Magneto Portable Car Telephone.

Magneto Iron Clad Telephone.

Fig. 27.

TELEPHONE SERVICE IN FREIGHT YARDS.

"In large freight yards clerks are employed to report the names and numbers of all cars entering or leaving the yards, and a record of the movement of every car is made in the car accountant's office.

"These yard reports are usually sent to the car accountant in writing, which, of course, requires labor and time, and delays the entries on the records. In some

yards these reports are made by telephone, the yard clerk reading from his memorandum record to the clerk in the car accountant's office, thus permitting records to be made promptly.

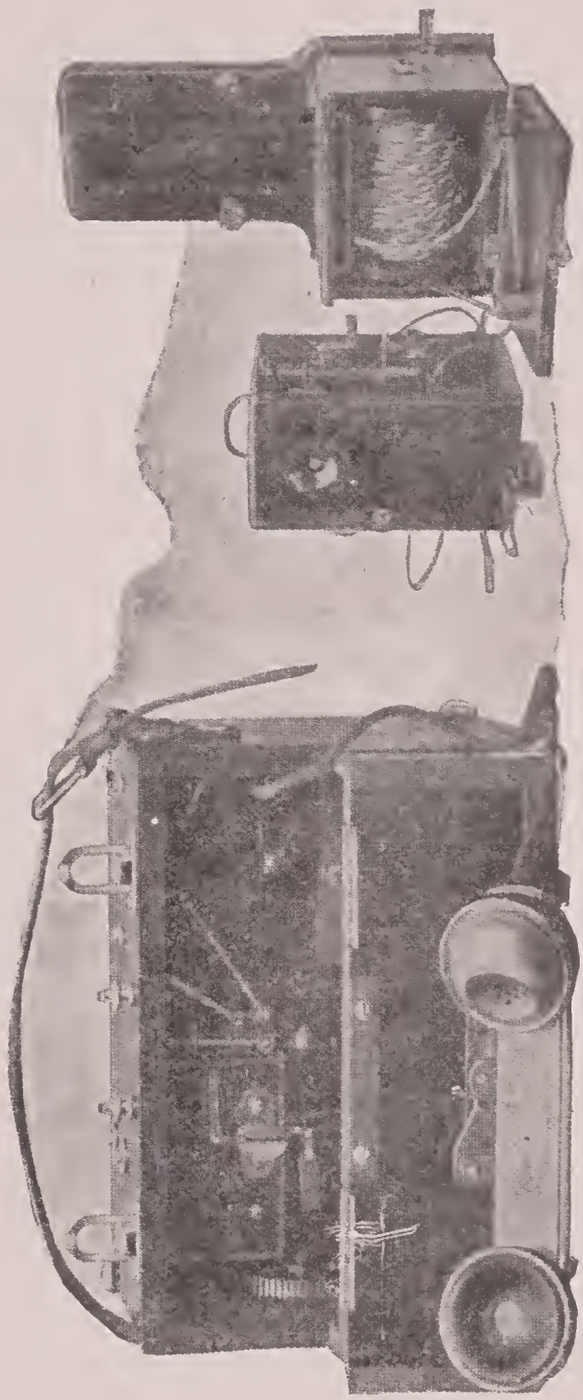
"Where perishable freight is being handled, a delay due to cars being held in the yards by mistake, or for repairs, often causes a considerable loss to the railroad. The use of the telephone by the yard clerk or the train master often enables these cars to be moved or repaired promptly, thus preventing the loss and rendering better service to the shipper."

COMPOSITE SERVICE.

"One of the objections raised by the railroads, where an attempt is made to introduce the telephone on their lines, is the expense of the necessary wire plant to meet their requirements. To meet this objection, special telephone sets have been designed, which may be connected to existing telegraph circuits without interfering with the operation of the telegraph, and without the latter interfering to any great extent with the telephone service.

"In this way a fair grade of telephone service can be rendered at a small expense for equipment, and experience has shown that this leads to a demand for better service and equipment.

"The telephone sets and other apparatus used for this railway composite service differ from that used in either magneto or central-battery exchange service. The signaling is done by means of an alternating current of high frequency, generated by a vibrator and induction coil in the set. This induction coil is also used for transmission purposes. The signal-receiving device, or



Magneto Car Telephone.

Magneto Lineman's Telephone.

Fig. 28.

howler, as it is called, consists of a special high-resistance telephone receiver, equipped with a resonating horn, to amplify the sound caused by the vibration of the diaphragm responding to the high-frequency signaling current coming over the line from the calling station,

"The intermediate telegraph stations on composited lines are equipped with a special 1 M.F. condenser and a 1,000-ohm non-conductive resistance, the condenser being bridged around the relay and key, so that telephonic transmission will not be interrupted when the telegraph key is operated. It also offers a path of low impedance for the high-frequency signaling current, and prevents the operation of the telegraph relay being affected by this current. The non-inductive resistance is bridged across the terminals of the telegraph relay to prevent the discharge of the condenser or the high-frequency signaling current affecting the operation of the telegraph relay. An impedance coil and condenser are necessary at the terminal telephone stations to reduce the interference from the telegraph impulses.

"The telephone service rendered by these sets, while not equal to that obtained on a straight telephone line, is, in many cases, good enough for the service required and, as stated before, has created a demand for better service, and has led to the construction of metallic telephone circuits.

"There are now several thousand of these sets in use throughout the country, principally in the Middle and Extreme West, where stations are far apart and the cost of constructing telephone lines correspondingly high.

"Two types of sets for this purpose are furnished—a wall set, in general appearance similar to the standard central battery-wall set with writing shelf, and a portable set. This latter is for use on trains, so that communication may be established with the nearest station at any point along the line, the connection with the telegraph line being made by means of a jointed pole, which is carried in the car."

"These portable sets are used extensively by some of the large Western roads, who carry one on every train.

"The length of line over which satisfactory service can be rendered by these sets varies with the kind, size and age of the line wire and the number of intermediate telegraph stations on the circuit. In general, 100 miles of No. 8 iron and 200 miles of No. 12 copper may be taken as the limit of this service.

LONG-DISTANCE SERVICE.

"The use of the railway composite sets has shown the railroad officials the advantage of telephone service between distant points, such as division headquarters and general offices, and in many cases this system is used between such offices. Where distances or the condition of the lines were such as to prevent satisfactory service, regular copper metallic-circuit telephone lines have been constructed. The distances covered in this manner vary from 100 to over 900 miles. For example, the New York Central and the Lake Shore Railways have a through metallic-circuit line from New York to Chicago. This line is used in sections between main points, as, for instance, New York and Albany, Albany and Buffalo, Buffalo and Cleveland, etc., for service between division offices, and is connected straight through when a New York-Chicago connection is desired.

"The Illinois Central has a similar line from Chicago to New Orleans, used in the same general way.

"The Pennsylvania lines also have their own long-distance telephone lines between important points.

"The development of this particular service has been confined principally to the larger systems, as the neces-

sity for such service on the smaller systems does not exist, and, further, the expense of constructing and maintaining such lines is considerable, causing an annual charge which would be greatly in excess of obtaining the required service over the lines of the American Telephone & Telegraph Company.

"As a temporary means of securing this long-distance service, many of the roads are compositing their copper duplex or quadruplex wires, and in this way obtaining first-class telephone service at a small expense. The Union Pacific has recently composited two duplex wires for this purpose between Omaha, Neb., and Cheyenne, Wyo., a distance of 500 miles, and is obtaining excellent service. In addition to using this telephone circuit for conversation between officials, messages are being sent over the circuit which were formerly sent by telegraph, operators being located at each end to send and receive messages by telephone. Those messages are written out in the same way as telegrams, and are handled exactly the same way, except as to the method of transmission."

"The Canadian Pacific has composited a circuit from Montreal to Winnipeg, a distance of 1,430 miles, with intermediate telephone stations at Fort William and North Bay. The Pennsylvania lines are also compositing their duplex and quadruplex circuits to obtain additional telephone facilities. The indications are that this particular branch of railway telephone service will show a marked development during the next few years, and will do much toward the further introduction of the telephone for railway purposes.

SERVICE WITH OTHER ROADS.

"The interchange of business between different roads entering large centers presents a further use of telephone service which has been found of great value.

"In many cases the private branch exchanges of connecting roads are connected with direct trunk lines, which permit of connections being established between the various telephone lines centering at these switchboards. This enables the transfer of cars to be facilitated and irregularities in these transactions to be cleared up in a few minutes which by usual methods would take days and frequently cause delays to shipments and in the case of perishable freight the loss of the shipment.

"The passenger departments also find this service of value, as it enables them to arrange for transportation and berths for their patrons who continue their journey on other lines and to clear up any misunderstandings which may occur, with greater speed than if they were obliged to connect through several exchanges.

OWNERSHIP OF EQUIPMENT.

"One of the problems in connection with railway telephone service which is now receiving the attention of railway officials responsible for this branch of the work, is that of the relative merits of leasing or owning their own telephone equipment.

There are advantages and disadvantages to both schemes, both from the standpoint of the railroad and of the operating telephone company, and no general decision seems possible, as the conditions in each case differ and the effect which the purchase of equipment would

have on the business in general is such as demand a careful consideration of the matter.

"The objections which immediately suggest themselves are, the maintaining of a satisfactory grade of service, and also the use and maintenance of the proper equipment, together with the loss in rentals of the operating company.

"Under present conditions the railroads can obtain at reasonable cost, apparatus of the same kind and quality as that now being leased.

"The larger roads are supervising their service with great care and are, in many cases, maintaining their equipment, in fact there are over 100 private exchange switchboards and nearly 5,300 leased telephone stations which are now being maintained by railroad companies throughout the country and apparently rendering service satisfactory to the telephone companies.

"All of the larger railroads have in their employ capable telephone men, who look after their service and maintain their plant, and those who are planning to extend their telephone systems are inquiring for men with telephone experience.

"Owing to the fact that the requirements of the railroad demand special apparatus, the investment is comparatively high. The maintenance of the apparatus is also higher than that experienced in the average plant, owing to inaccessibility of many of the stations, and the exposure of the apparatus to frequent use and also abuse.

"It is believed that the various new conditions which will arise in connection with the future development of railway telephone service will be met by the operating companies in such a manner as to retain this class of service, and that the next few years will see a development which will greatly exceed that of the past."

POINTS IN FAVOR OF TELEPHONY.

Some of the advantages of train dispatching by telephone are:

The ease and rapidity of handling trains.

Selective signaling of any or all stations.

More detailed information of train movement possible.

Short interval of time to signal stations.

Eliminating of noisy telegraph systems.

Direct connection with trainmen when necessary.

In case of accident to operator, anyone can answer a telephone.

Train dispatcher can issue general orders to all stations at the same time when necessary.

Increase in the safety of train operation.

It is possible to arrange apparatus in superintendent's office so that he can listen to actual work of the dispatchers and operators, and check up any tendency of slackness.

SIMULTANEOUS TELEPHONY AND TELEGRAPHY.

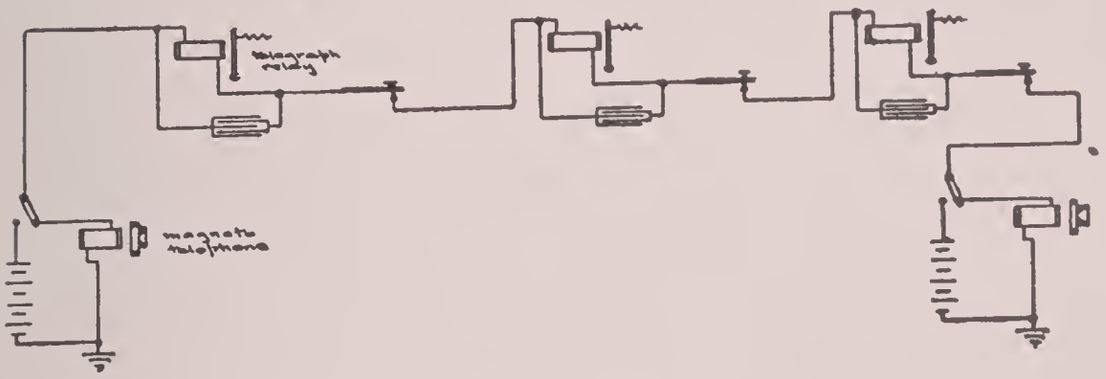
The combination of telephone and telegraph service upon the same line wires is important in some cases in the adaptation of the telephone by railways for transmitting train orders, it makes its use possible on some roads much easier than would be the case if a complete separate installation had to be made. It means that the telephone can thus be applied to railway service for the operation of trains without additional cost for installation or maintenance.

The duplex system, as it is called, which permits simultaneous telephony and telegraphy, is, it is claimed, one of the most wonderful circuits, in many ways, which has ever been put into actual operation. It has been satisfactorily demonstrated that it will under certain conditions, permit of four separate and distinct telegraph messages and one telephone communication to be in progress at one time over one grounded telegraph line, without introducing objectionable interference between the different circuits. It is said that this system is very efficient when used on grounded telegraph lines, and it has, in some cases, been applied to lines over one hundred and fifty miles in length.

By the courtesy of the publishers of "Telephony" and with their permission, we are enabled to give the following description and illustrations of the system and the fundamental principles of simultaneous telephony and telegraphy, by Mr. Francis R. Hoyt, who states:

"You can telegraph through an impedance but not through a condenser, and you can telephone through a condenser but not through an impedance. Simultaneous telephony and telegraphy is not a new branch of the telephone business. There appears in the records at Washington a patent dated as early as May 7, 1878, covering what is today the first step in one of the most elaborate systems in use. This circuit, shown at Figure 29, is nothing more than a grounded telegraph line with condensers bridged around the telegraph relays or actuating apparatus to permit of the free passage of the voice currents. Though this circuit in its day was a wonderful advancement in telephony it had its drawbacks when put into practice, and in reality it is not a simultaneous circuit, as it was only intended to use the telephone at

such times as the telegraph was idle. This, however, could be remedied by a proper arrangement of connections, but in that case we would encounter several drawbacks; chief among these being that for ringing purposes a high frequency current would necessarily have to be used, because to ring with a magneto or generator one side would have to be grounded and the current from the other side would chatter all of the relays whenever applied to the line, thus interfering with any signals which might be in transit at that time. In the form shown the system was never adopted as a commercial branch or addition to the telephone or telegraph office,



Simultaneous Transmission Theory.

Fig. 29.

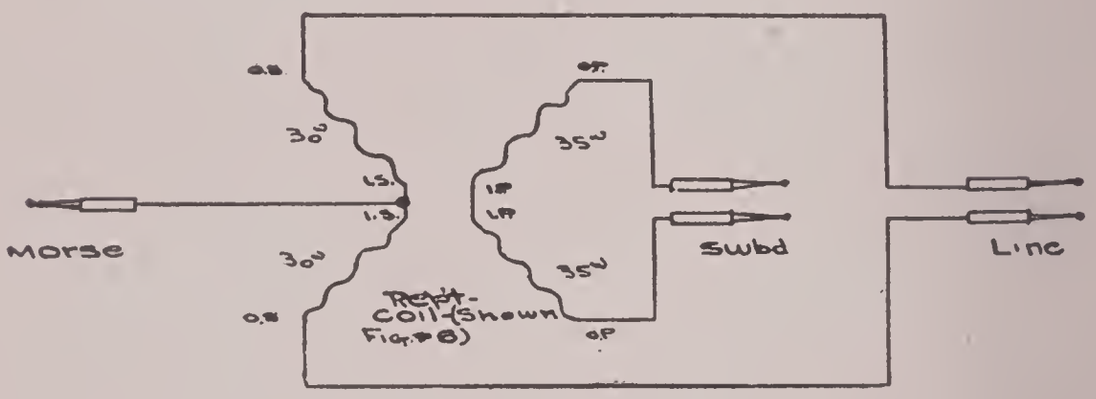
but it thoroughly demonstrated the fundamental principles as outlined above, which, proved the stepping stone for other great minds; and as a natural sequence there followed our present day simultaneous telephony and telegraphy systems. The railway composite used to such an extent all over the country today is merely an elaborate form of this simple circuit."

"We may say that simultaneous work is divided into four classes, which are as follows:

"First, simplex circuits, that is, a circuit by which one telephonic and one telegraphic communication can be transmitted over one metallic telephone line."

"Second, composite circuits, or circuits by which two telegraphic and one telephonic communication are made possible without the least interference over one metallic circuit.

"Third, polar duplex circuits, which render four telegraphic and one telephonic communications not only possible, but of the highest commercial efficiency, and when properly installed and balanced, give equally as good results as either the simplex or composite.



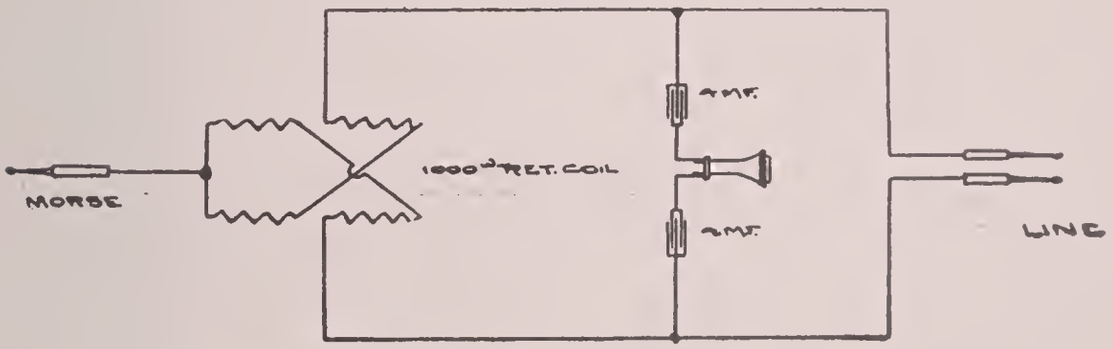
Repeating Coil Simplex Plan

Fig. 30.

"Fourth, railway composites, so termed because they are merely telephone circuits added to the telegraph lines usually operated by railway companies, so that they can despatch their trains, or in fact conduct any business quickly and privately over lines already doing manifold duty and without paying a toll or having any additional maintenance cost. No matter how heavily loaded the line may be nor how old the iron wire, it is possible to secure a good conversation over distances of from 125 to 150 miles, and never know you are talking over a line

carrying telegraph messages, provided the line is well insulated with respect to the ground."

"Simplex circuits in turn are divided into two main branches, *i. e.*, those using repeating coils at either end of the line with the telegraph tap taken off the line side of the coil as shown at Figure 30, and those using a retardation coil with the telegraph tap taken off of the center of the coil as shown in Figure 31. Both of these circuits are used extensively by long distance companies throughout the United States, some using one and some the other. In most cases it depends entirely upon the amount of telegraphic work they intend doing or will be

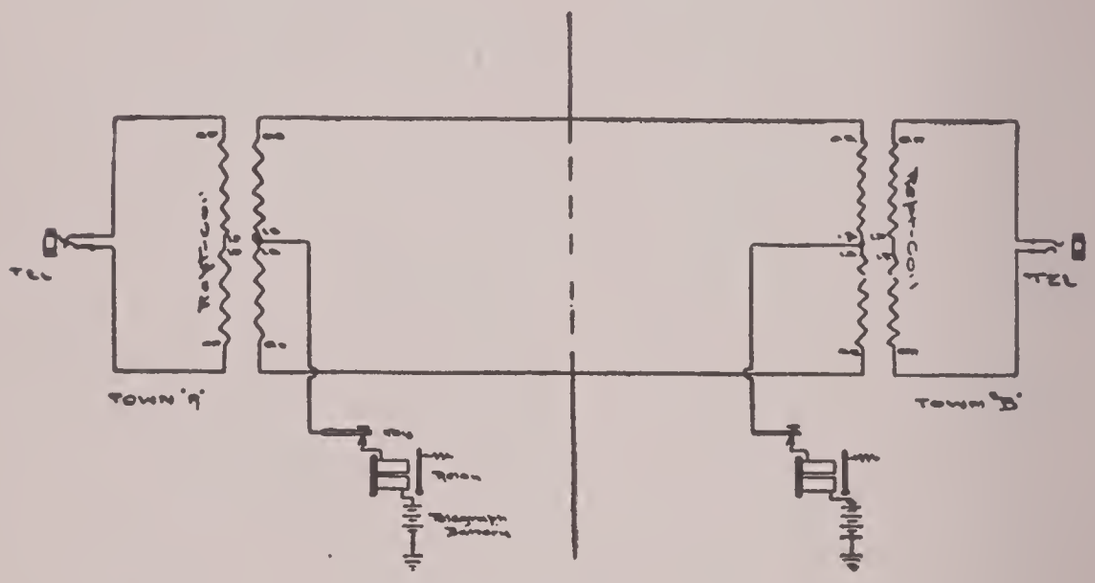


Retardation Coil Simplex Plain.

Fig. 31.

able to do, which circuit they adopt. Primarily each has its advantages over the other, but from a commercial point of view, that is, as regards transmission, the retardation coil simplex has a shade the better of the two circuits, and can be rung over a considerably greater distance. However, the circuit shown at Figure 30 is the one most used where the business is not great enough to justify the installation of composite ringing equipment, the stronghold of this circuit resting in the fact that any exchange generator or pole changer whether grounded or not will do for ringing purposes, but is lim-

ited to one hundred miles of aerial line (No. 12 copper), including five miles (No. 19 gauge) underground cable; which figure is based on a generator typical of the average used in telephone exchanges throughout the country, that is a two-pole machine usually run at about 1,000 revolutions per minute with a secondary output of from 75 to 90 volts alternating, or about the same as a Warner pole changer.



Two Terminating Stations of Repeating Coil Simplex System.

Fig. 32.

"A glance at Figure 32 will show the electrical operation of the repeating coil simplex, which is simple in the extreme. The conversation is carried on through the repeating coil and over the line wires; the telegraph tap being taken off the line side of the repeating coil forms virtually a wheatstone bridge arrangement, the current flow dividing in the center of the coil and flowing equally through the imaginary arms of the bridge, producing no circuit unbalancing and consequently no inductive dis-

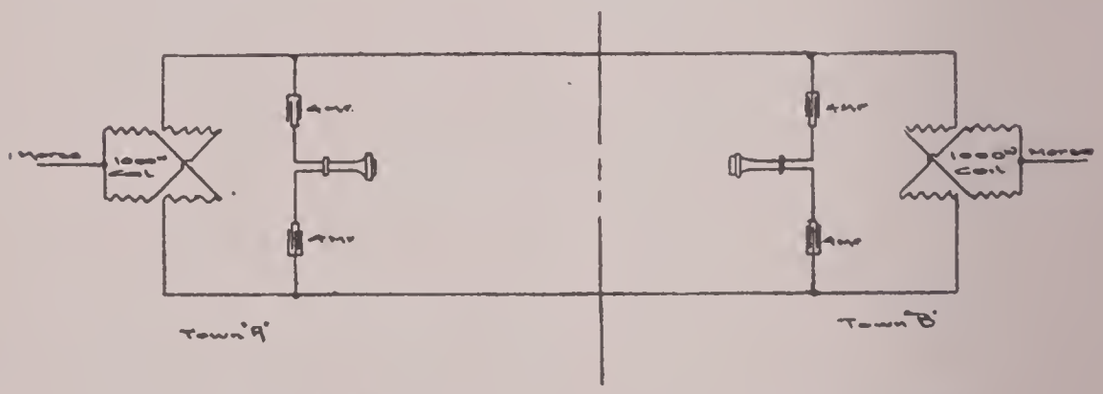
turbances. The actual current flow is prevented from flowing back to the switchboard side by the open circuit relation of the two windings; ringing over this line is done the same as in any other case where repeating coils are used, and does not chatter the telegraph relays as only the alternating impulses are transmitted over a repeating coil and not the ground effect, which would be necessary to chatter a relay so connected.

"It would be well to mention here that this is the only simultaneous circuit that is not based on the fundamental principle as given before, but instead is based on the wheatstone bridge theory of balanced circuits, which is made possible by the use of the repeating coil.

"The repeating coil used in this circuit is one that to give the proper results requires some deliberation in building, as it must serve the double purpose of ringing as well as talking, and more than that must offer as little impedance as possible to the high frequency voice currents traveling either into or out of the coil; yet on the other hand, the primary and secondary windings with respect to one another must present as great an inductive choking effect as possible in order to choke the make and break discharges of the telegraph key which otherwise would produce a series of low interruptions on the switchboard side of the coil exactly the same as the telegraph impulses being sent at that time on the line side of the coil. At a single glance it seems hard to believe that a coil which will work properly when connected as shown at Figure 32 will not work if the terminals marked O. P. and those marked I. P. were to be reversed, in other words will induce from its outer terminals in, but will not induce from its inner terminals out; yet this is a fact and is the whole solution of a re-

peating coil to be of practical use on simultaneous circuits.

"Figure 34 shows an excellent coil for simultaneous purposes, and throughout this talk it will be taken as a standard. Repeating coils are made in two main forms generally, one form having a closed magnetic circuit and the other having an open magnetic circuit; here, however, it will be unnecessary to consider the last named form. The output of a repeating coil depends on the number of turns in the primary and secondary, the number of lines of force cut, and the rate of change. Knowing this and also the great difference in the frequency of ringing and talking currents, it follows that a coil suitable for our purposes must adapt itself to both conditions readily.



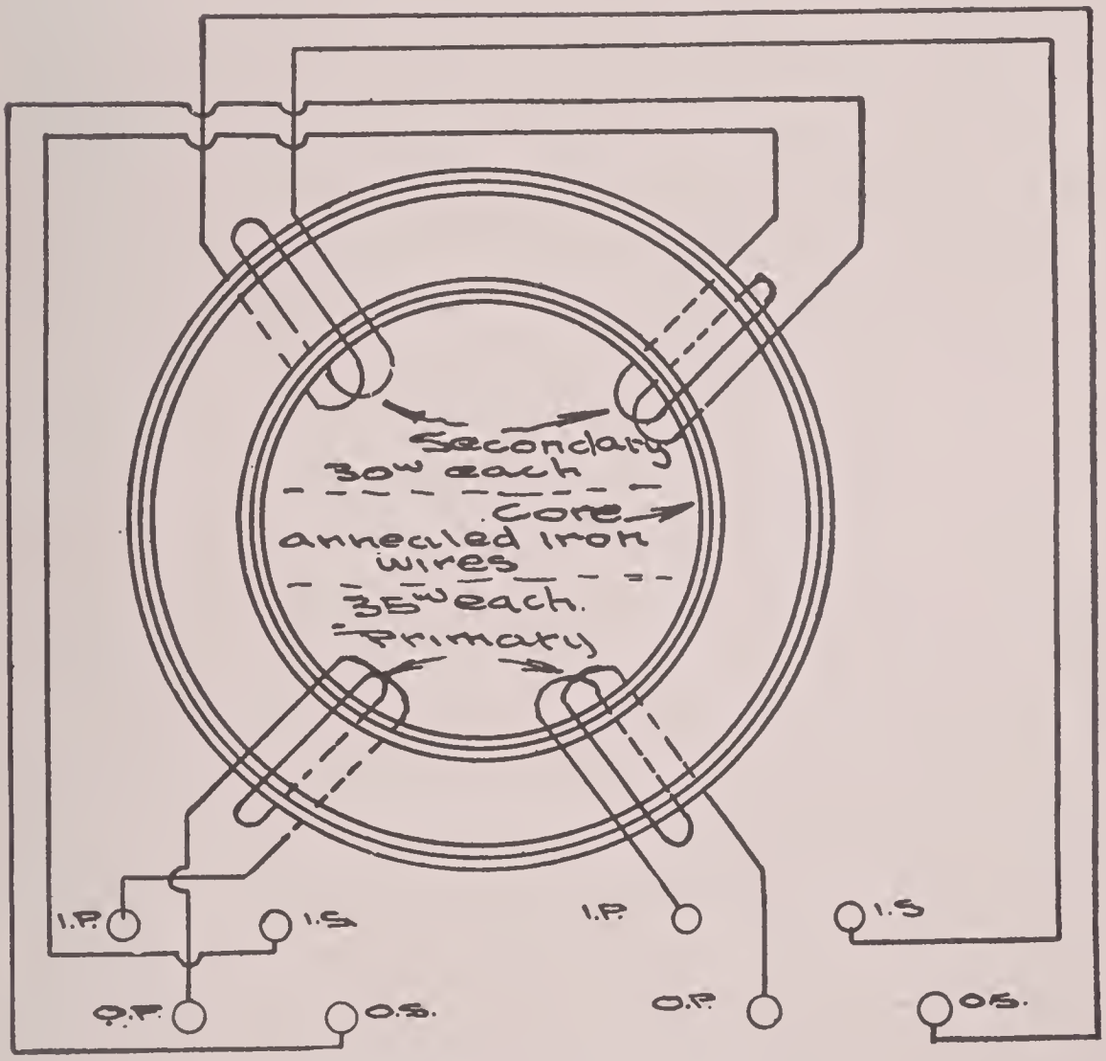
Two Terminating Stations Retardation Coil Simplex System.

Fig. 33.

"The core of this coil is made of fine wire carefully annealed to prevent hysteresis losses and each individual wire is thoroughly oxidized in order to form a resistance or partial insulation between themselves.

"As the frequency of talking current is very great, it follows that if the iron core is at all sluggish the speech will be distorted and transmission will necessarily be very poor, which means that as small an amount of

iron should be used as possible, because the more iron the more sluggish the coil becomes. Yet on the other hand, the frequency of ringing current is very low, consequently there should be a great number of turns, and a great number of lines of force cut, which would also



Repeating Coil for Simplex Work.

Fig. 34.

mean a large amount of iron in the core. From this it is easy to see that a happy medium will have to be struck, that is, a coil which will not prove detrimental to talking currents, yet will allow enough ringing current to

pass through it. In addition, this coil must be so wound on the primary and secondary that the line when connected to the proper terminals will feel no great impedance as the result, that is, each half of the primary and secondary must be in agreeing series with the other half of its respective winding. A peculiarity of this coil is that the four windings are on opposite sides of the core from each other, not like most coils in which one-half of the secondary is wound over its respective half of the primary. A glance at Figure 34 will show that an alternating current passed through any one of the four windings will cause magnetic lines of force to be generated in the iron core, which will cause similar fluctuations in the other three windings. Another peculiarity and the most essential thing to a simultaneous coil, is that while each half of the primary and secondary when properly connected to a line are in series so far as the direction of the windings go, yet on a close examination it will be seen that a current applied to the center of the coil as the telegraph current is, and forced to flow out through the two windings in equal parts, does not find its path through the coils in series, but instead, as this current flows from the terminals marked I. S. and I. S. through each of the two windings to the line, its path through each coil is in exactly the opposite direction from the current in the other half; consequently it is plain that the reason there is no induction from the telegraph tap, is because when this current flows it makes its way out in a differential path and does not cause any magnetic lines of force to be generated in the iron core, so there can be no change of value in the other windings.

"In this way the voice currents coming into the coil

induce from the secondary to the primary windings exactly the same impulses, but the telegraph current flowing from the center of the coil does not cause any variation on the windings opposite.

"Repeating coils for simultaneous purposes will naturally assume a larger size than the average coil, and should always be provided with a boiler plate or cross-talk proof cover where more than one coil is used, to prevent mutual induction between coils."

"The repeating coil simplex as explained in the last article, adapts itself more readily to small plants where the volume of telegraph business is not great enough to demand more than one telegraph message per pair of telephone wires. In cases of greater demand some other form of telegraph circuit must be used, arranged so that a simplex, composite, or if necessary, a polar duplex can be immediately set up and put into practical operation without any change in the ringing circuits of the switchboards. That is, there must be a conformity not only of apparatus, handling, etc., but conformity of operation. As this operation means practically the ringing by operators over these lines, every line should in itself control the ringing current it is to furnish at the distant end, and should do so without the operator's knowledge. From this we can see that in cases of composite and polar duplex circuits where high frequency ringing current must be used, the simplex circuit to be used in conjunction with these should also use high frequency current not only in order to keep the test panel as near uniform as possible, but because the cost of installation is no higher, the ringing can be done at a much greater distance, and the efficiency is if any thing, slightly improved. As was stated in the previous article, a repeating coil to be of

practical use in simultaneous work must adapt itself readily to both ringing and talking; and as any transformed energy must undergo a transformation loss, it is plain that when the repeating coil is taken out of the talking circuit the transmission will be improved. This must not be taken to mean that it is not possible to ring through a repeating coil of this kind with high frequency current; the fact is that using high frequency current on a repeating coil simplex will improve its ringing capacities.

"A simplex circuit using the retardation coil was shown at Figure 31. The only objection that can be offered to this circuit is that it can not be used without a composite ringer, or in other words without a high frequency current for ringing; but as this circuit was designed for use in connection with composites, polars, etc., as explained above, this is immaterial.

"Figure 33 was a sketch showing the theoretical operation of the retardation coil simplex, and clearly defined the fundamental principle that one may telegraph through an impedance but not through a condenser, and telephone through a condenser but not through an impedance. The retardation coil used in this circuit has 1,000 ohms resistance and a very high coefficient of self induction, so that the rapidly vibrating voice currents traveling over the metallic line circuit pass through the condensers and into the switchboard and vice-versa, without attempting to thread the retardation coil. A current of very high frequency will always take a path of ohmic resistance in reference to a path of self induction. Probably the most confusing terms used by the practical telephone man are self-induction and impedance. In simultaneous work especially these terms should be clear

to all who have occasion to use them; but unfortunately, like all other theoretical phrases and branches of our business, these terms have been shrouded with mystery, and seem to be beyond the comprehension of the practical electrician. In reality they are very simple, and in this case the whole confusion has been caused by the name given the coil (impedance) which is representing a self-induction unit and not a unit of impedance. For, to be absolutely correct, impedance means "any opposition to current flow," the theoretical definition of which is, "a quantity expressed in ohms equal to the square root of the inductive resistance of the circuit and the ohmic resistance," or to use plain terms it is the sum of the ohmic resistance and the spurious resistance of a circuit expressed in ohms. From this it can be seen that if we had a circuit in which there was a condenser, a non-inductive resistance, an inductive resistance and any other resistance offering devices, we could calculate the ohmic resistances of them all, add them and say the impedance of the circuit was of certain amount, expressed in ohms. If alternating current was applied to this circuit (the terms self-induction and impedance never being used except where an alternating or an interrupted direct current is concerned) we would find that there was more retarding effect in the inductive coil alone, than in all of the other branches together, which goes to show that the impedance effect is nothing more than the ohmic resistance of the circuit, while the real opposition is in the self-induction of the so-called impedance coil. Self-induction means, the induction of a circuit or coil on itself and should always be expressed in henrys (the unit of self-induction). A peculiarity of the impedance coil is that the opposing power is instantaneous, that is, it is

at its full value at the same moment that the impressed current is started or stopped.

"So then when it is said that the high frequency voice currents will take the path of the greatest ohmic resistance in preference to a path of any self-induction, it is meant that the voice currents will take the path line, condensers, etc., instead of trying to enter the retardation coil. While this coil has a very high resistance, in most cases it is very small as compared with the resistance of the line."

"The resistance of a condenser to an alternating current of any known period can be calculated by a very complex formula which it is not necessary to consider here, but it might be added that an ordinary two microfarad condenser with a ringing machine as mentioned in the first article offers a resistance of close to 500 ohms and a standard one microfarad condenser in the same circuit would be about 1,000 ohms. As the resistance of a condenser decreases as the frequency increases, it follows that this same condenser in a talking circuit would offer resistance so very low that it would not prove detrimental to the transmission.

"From these explanations of the fundamental principles we can understand just how it is possible for telegraph impulses to be sent over wires carrying a telephone message, and all the elaborate systems are based on these simple foundations.

"In the circuit shown at Figure 33 the conversation is carried on from the switchboard circuits, wiring, apparatus, etc., shown on the drawing by a receiver, through the condensers past the retardation coil and out over the line to the distant end suffering loss only by the ohmic resistance of the line plus the switchboard

wiring. It is not made noisy or in any way interrupted by the telegraph impulses, as they are prevented from flowing into the switchboard by the condensers, which being exactly equal on both sides of the line circuit do not produce a flow of any kind. This is a good example of the wheatstone bridge principle referred to before.

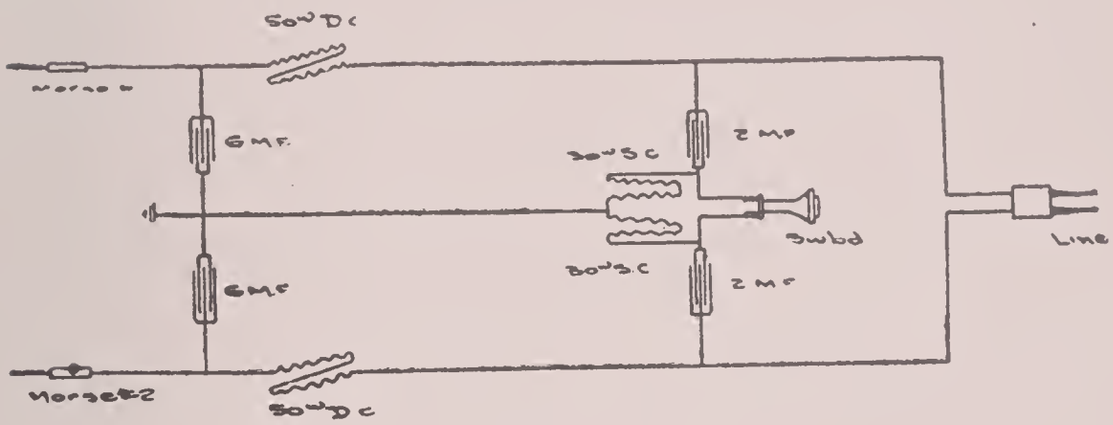


Fig. 35.

"Figure 35 shows a composite circuit, from which we derive two telegraph circuits and one telephone communication from one metallic telephone line, the only difference between this and the retardation coil simplex last explained being that in this case each side of the line is used independently of the other for a telegraph message which is made possible by the use of condensers. Of course the apparatus used in this circuit is somewhat differently arranged and of different values, but the principle upon which it is based is exactly the same as that of the simplex circuit.

"In Figure 35 the two telegraph circuits are represented by the words "Morse 1 and Morse 2," the switchboard apparatus by the receiver, and the line by that name. There will be noticed in front of the retardation or im-

pedance coils the letters "D. C." and "S. C.," which mean respectively differentially connected and serially connected. There are two each of these coils, two being bridged directly across the talking and ringing circuit and two being in series with the telegraph taps. The two serially connected coils offer the greatest amount of self-induction to the talking currents and are put in the circuit purely for balancing purposes. A ground tap is introduced between the coils which tends to quiet the

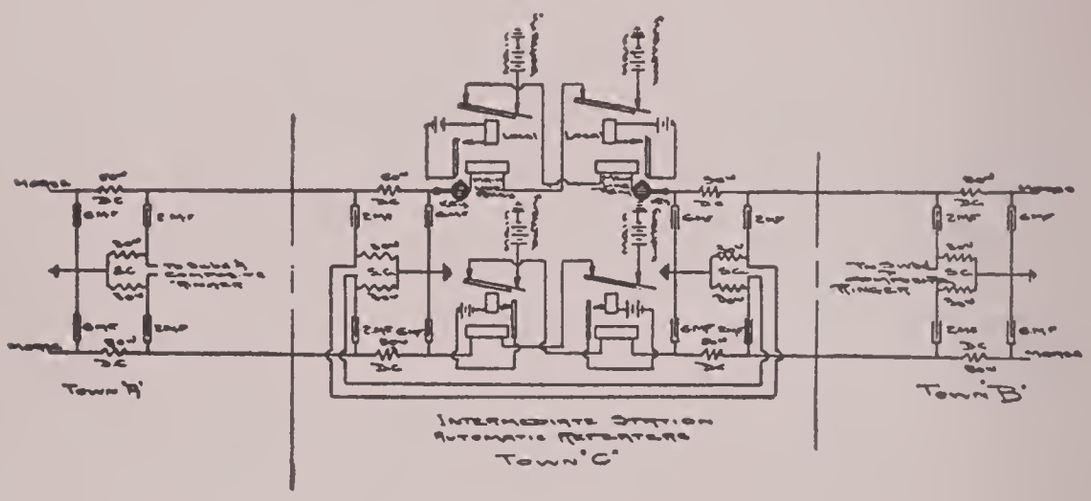


Fig. 36.

line at all times, yet these coils offer enough retarding effect to the talking currents to prevent any loss through them to ground. The differentially connected coils do not impede the talking currents quite so much, but the effect is great enough to prevent any loss in them, and not sufficiently great to raise the self-induction to such a point that it will interfere with speed in signaling on the telegraph. That is, if the self-induction of the coils were too great the counter electromotive force, which as explained before is always at its full value at the time of making and breaking the circuit, would oppose the

current flowing to such an extent that the speed of the telegraph impulses would be affected.

"The two microfarad condensers prevent the discharges of the telegraph key from flowing back to the switchboard, and the six microfarad condensers act as static collectors, that is, they reduce the static capacity of the line by offering a by-path through them to ground, which also tends to quiet the line.

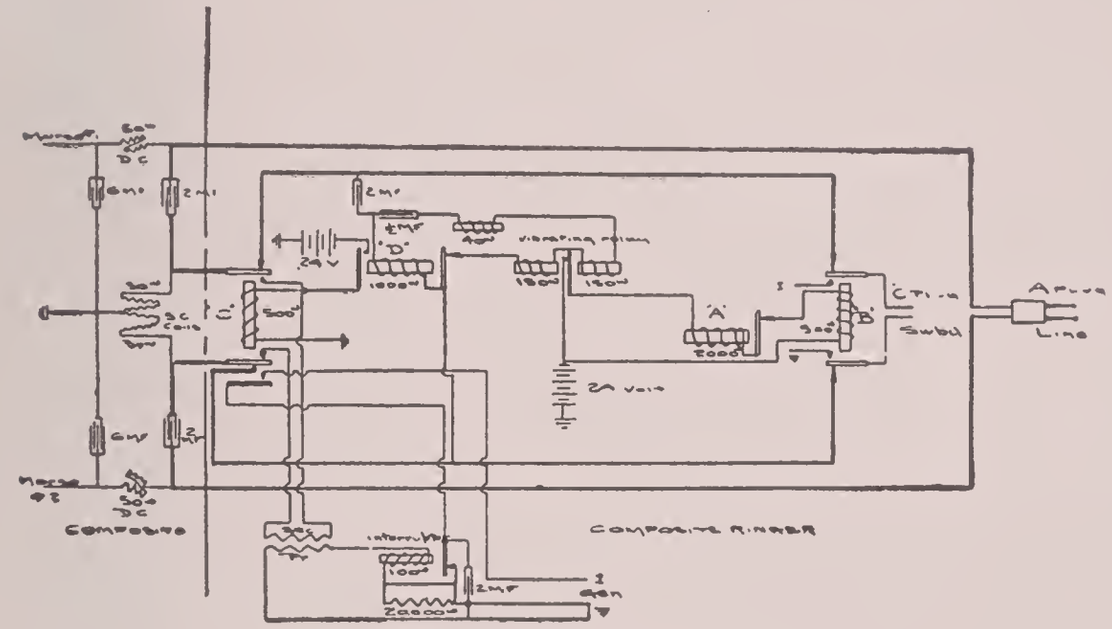


Fig. 37.

"We can now follow the transmission circuit from the point shown by the receiver. The talking currents originate in the switchboard circuits, flow out to the serially connected retardation coils without attempting to enter them, through the two microfarad condensers, and take the path of the line in preference to flowing through the differentially connected coils and telegraph relays to ground. In order to find the origin of the talking currents it is necessary to continue the circuit from the part marked "receiver" in Figure 37. As the same pair

of wires used for the voice currents must also control the high frequency ringing current it is obvious that at this point in the circuit, between the line and switchboard apparatus, is the proper place for the installation of the composite signaling system. This is a series of apparatus as shown in Figure 37, which can be applied to any composited circuit to allow the use on such a circuit of the regular seventy-five volt ringing current. This is accomplished by transforming the regular grounded ringing current to a metallic high frequency current at the calling end which, being carried to the distant end, actuates such apparatus as will cause the regular ringing current at that place to set the signal.

"For each composite line or line requiring high frequency ringing there must be one of the circuits shown at Figure 37, complete, with the exception of the relay and apparatus marked "interrupter;" which can be used in common by five circuits, but should never exceed this number.

"The operation of the composite signaling system is as follows. When a ringing key at the calling switchboard is depressed the generator current flowing out operates the ringing relay D also at the calling end. This cuts the vibrating relay off and closes the twenty-four volt battery circuit through the C relay, which, when it operates switches the line for the switchboard side to the terminals of the interrupter, which is also put into operation by the outside contracts of the C relay. The high frequency current generated by the interrupter and sent over the line operates the vibrating relay at the receiving end, thus opening the twenty-four volt battery through the A relay, which on dropping back closes the battery circuit through the relay B, and opening the line

from the switchboard side throws the central office generator of the receiving office onto the switchboard circuits and operates the signal.

"The following is a general description of each piece of apparatus in both the composite and composite signaling systems.

"The retardation coils are shown at Figure 41. The serial and differential effects are gained by a difference in strapping as shown. The core is made the same as the core of the repeating coil explained, in the first article, except that there is a large amount of iron in it, and a great number of turns of copper wire, in fact, about three times as much as in the repeating coil and of wire about six sizes larger. From the explanation of the repeating coil it can be understood why the coils are made in this way.

"The two microfarad condensers are ordinary condensers made of tinfoil, dexter paper and paraffine, with an insulation resistance of thirty megohms, to stand a break down test of 500 volts.

"The six microfarad condensers are simply three two microfarad condensers strapped together in parallel.

"The A relay in the composite ringing circuit is an outside contact relay, of very high resistance because the battery is closed through it all the time, and if the resistance were lower it would consume too much current. A part of this resistance is German silver wire added for this purpose.

"The B relay is an ordinary make-and-break type.

"The C relay is exactly the same as the B relay with two outer contacts added.

Relay D is a ringing relay, that is, it is a slow act-

ing relay with very little tension on the armature. A part of this winding is also of German silver wire.

"The vibrating relay is a polarized relay with the armature mounted between the two cores as shown, each coil wound with copper wire to a resistance of 150 ohms. As a result of being polarized it is not subject to alternating current impulses, and can only operate on the high frequency current which has a constant polarity. The action of the relay is to draw both parts of the armature towards their respective cores and thus open the made contact.

"The interrupter is of the buzzer type, set into operation by the alternating current, which is interrupted at a great frequency and sent out on the line through a transformer (step-up) with a ratio of about two to one. The transformer, however, is used mainly to convert the grounded generator to a current free of a ground. There is a resistance of 20,000 ohms bridged around the buzzer to prevent sparking at the contacts, which can be made either of graphite or German silver.

"The ringing current in operating the D relay flows through the two microfarad condenser and relay, but is of too low a frequency to force its way through the one-half microfarad condenser and impedance coil to the vibrating relay to any extent. The high frequency current on the other hand prefers the path of the condenser and low impedance coil through the vibrating relay, to the self-induction of the 1,000 ohm relay; but on account of the sluggishness of this latter relay it would not operate even if the full current was spent there.

"The composite telegraph and composite ringer circuits are wired to the wire-chief's desk and plug-ended as shown. In this way they can be immediately put on

any line in the office, as each toll line comes through the toll test panel in the circuit shown by Figure 38. In order to put the telegraph on this line the plugs marked A, Figure 37, are inserted into jacks marked A on Figure 38, and the same with the plugs and jacks marked C.

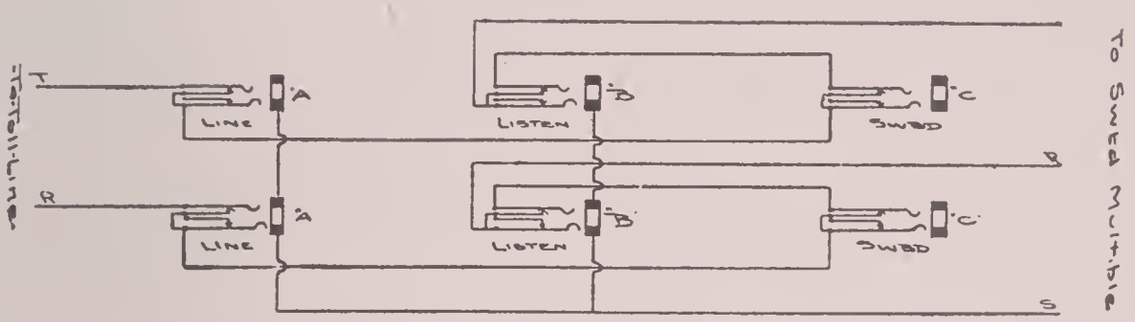


Fig. 38.

"In order that the wire-chief can thoroughly test these lines his desk is wired with circuits as shown in Figures 39 and 40. In this way, if he wishes to plug a telegraph tap through his office, or out to some subscriber in town, he can do so by putting the Morse plug (Figure

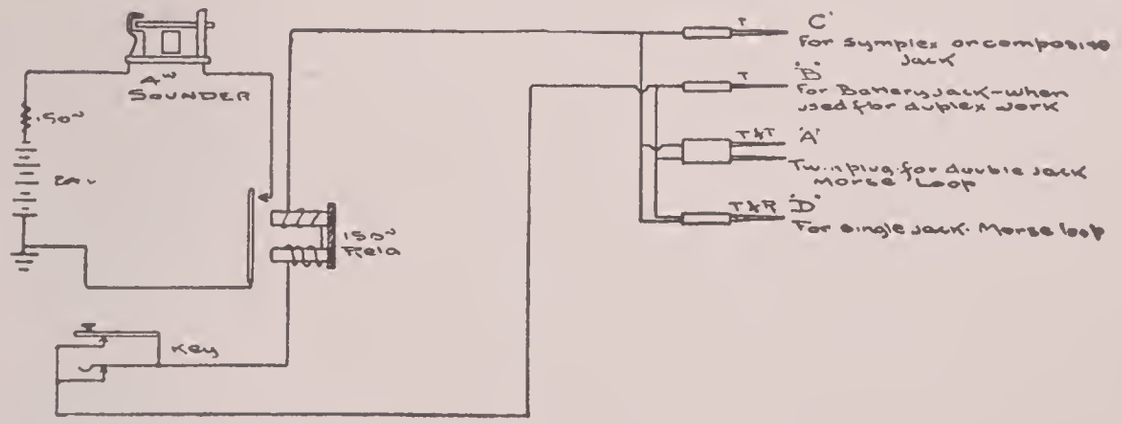


Fig. 39

37) of the composite, into the jack of the subscriber and furnishing battery at the subscriber's station; or he can bring the subscriber's station back to his desk on a loop

circuit and furnish the battery through a patching cord to the battery jacks. This is all shown by the jacks 4, 3, 2, 1, respectively, Figure 40.

"Figure 39 shows the wire-chief's telegraph circuit. This is so arranged that he can cut any line or lines through his instruments and monitor them, or he can get in on any line and test; the drawing is self-explanatory.

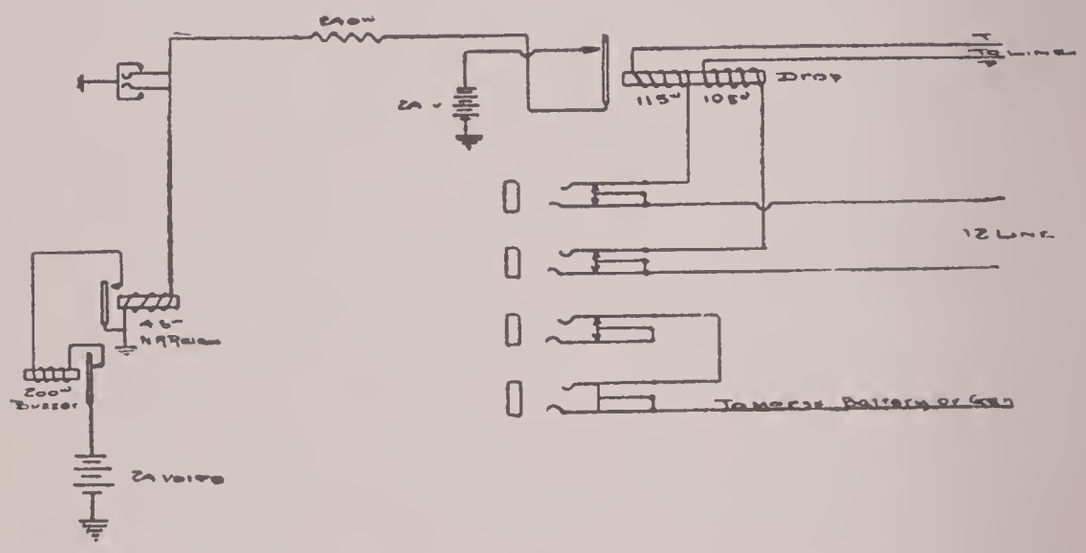


Fig. 40.

"The following are a few notes well to remember:

"An interrupter for high frequency should give at least 300 pulsations per second.

"The operating current of a standard 150-ohm morse relay is four one-hundredths of an ampere.

"Telegraph potential should be five one-hundredths of an ampere at each end of the line."

"A standard morse relay with the armature in contact with the cores has a self-induction of about eight henries.

"Increasing the number of composite sets in series decrease the speed of signaling.

"A short method of figuring the number of gravity cells necessary (when they are used) on telegraph lines, to give the proper operating current for the relays, is to simply divide the total resistance by twenty-three. The result obtained is the number of cells necessary.

"For the number of cells necessary to operate four ohm sounders, divide the total resistance by two.

"The electro-motive-force of a gravity battery is one and seven-hundredths volts; the internal resistance two ohms."

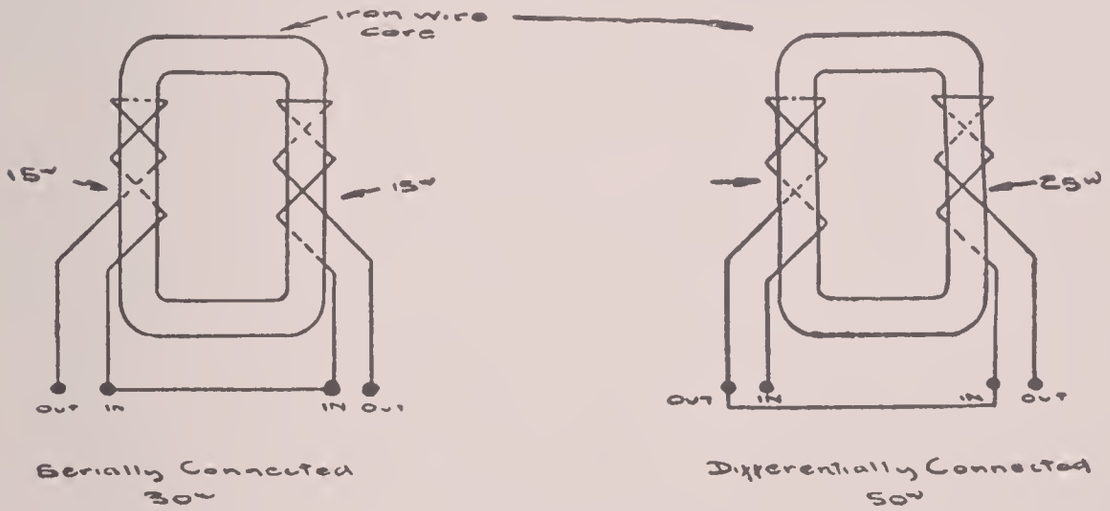


Fig. 41.

"The polar duplex as used in simultaneous work by telephone companies is quite a deviation from the polar duplex in theory, as laid down by the inventor and adopted universally by telegraph companies. It is only recently that any attempt has been made to apply this system in connection with telephone circuits, but within the last year or two there have been numerous efforts to secure a telegraph circuit of commercial value which would give more than two telegraph communications per metallic line and not interfere with telephone conversations carried on at the same time. Every known form of

duplex circuit and system having been tried, the three main or well-known duplex systems are the differential duplex, the polar duplex, and the duplex bridge method. The conclusion finally arrived at by engineers was that the polar duplex gave the best results. Further experimenting with this showed that a practically perfect duplex circuit was obtained by using the polar theory but in a duplex bridge form. The theory of the polar duplex is shown in Figure 42 at *A* and the theory of the duplex bridge method is shown at *B* on the same figure. A glance at Figure 43 will show the conclusion arrived at by the engineers, and needless to say this is the system in use by all companies furnishing this class of service."

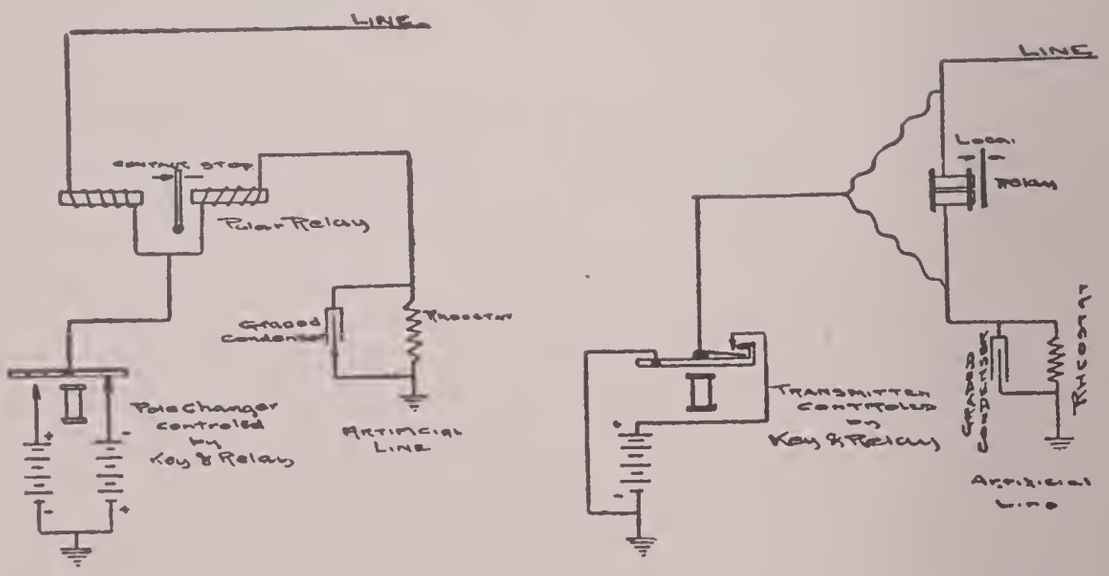


Fig. 42.

"The circuit evolution from Figure 42 to Figure 43 is very simple. The latter is a combination of both theories, to the extent that the circuit adopted uses the polarized relay and has its battery potential of opposite polarity, while the position of the relay has been changed in order

to be the same as in the duplex bridge method, and the bridge arms have been added."

"Figure 43 is simply a schematic arrangement of the circuit, but shows all the apparatus, and clearly defines its operation. The circuit is so arranged that it can be used either on a composited line to gain four telegrams, or on a simplex line for two telegrams. This is done sometimes when the resistance of a single wire would be too great

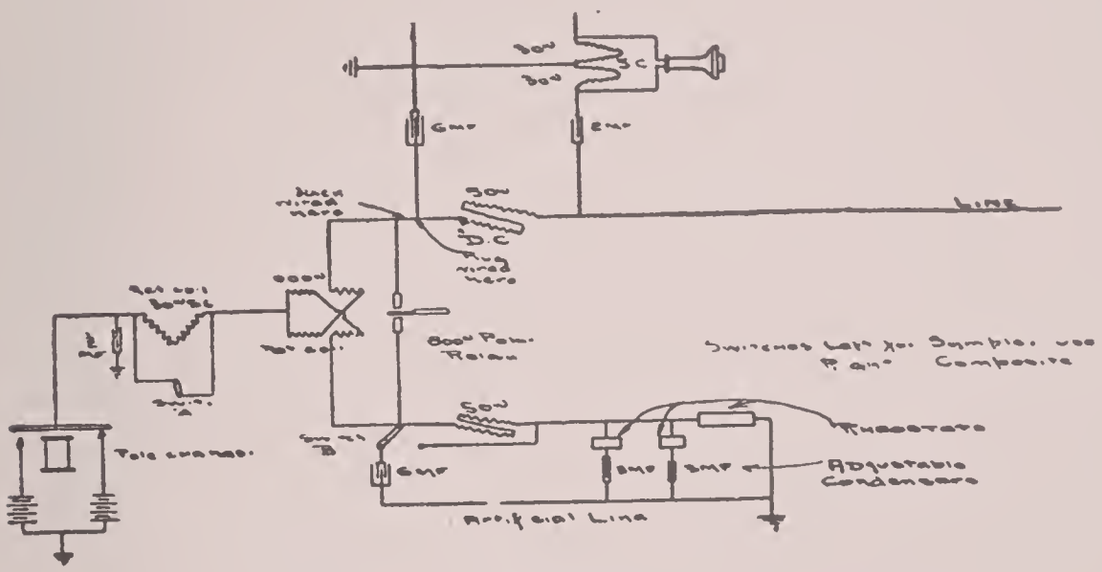


Fig. 43.

to secure successful operation. By using it on a simplex the resistance is cut in half by using both wires, making the circuit commercial. It is used in conjunction with the simplex and composite apparatus in order to prevent any disturbances.

"If desired on a simplex circuit all that is necessary is to put the plug marked "Morse" (Figure 31) into the jack shown by the word "Line" on Figure 43. The same applies to the composite circuit, except that both Morse plugs are used and two of the circuits shown at Figure 43. The note on this drawing tells what position the

switches should be in for each of these arrangements. These switches are for balancing purposes only. When used on a simplex, switch *A* shorts out the thirty-ohm serially connected coil, and switch *B* opens up the six microfarad condensers, at the same time putting a short circuit around the fifty-ohm differentially connected coil. This throws one side of the polar relay on to a straight artificial line, which is all that is necessary in this case to secure a perfect balance. When the polar is used on a composite the switches are moved to the left. *A* adds the self-induction of the impedance coil to the circuit in such a place that it affects the telegraph current at the very outset so that its effect is felt equally in the line and artificial line, and *B* puts the six microfarad condensers and fifty-ohm differentially connected coil into the artificial line in exactly the same place as they are in the composite circuit or main line. This is necessary in order to secure a perfect balance; otherwise the telegraph current in the main line would be stronger than in the artificial line, which would cause the polarized relay to respond to impulses sent from its own office."

"The artificial line referred to above is used on all duplex circuits and is absolutely necessary to secure their operation. The artificial line on a duplex circuit of any kind, when not used for simultaneous purposes, consists of a rheostat and graded condensers. The rheostat is sufficiently broad in range to actually equalize the ohmic resistance of the line and apparatus at the distant end, and the condensers are graded so that they will very nearly offset the static capacity of the line and condensers at the distant end. This is shown in Figure 42 at *a* and *b*, marked 'artificial line.'"

"The operation of the polar duplex as used by tele-

phone companies is as follows: as far as the transmission goes there is very little added in this circuit to offset it because the composite circuit apparatus pretty thoroughly prevents any escape currents from flowing; however, the 1,000-ohm retardation coil serves the double purpose of bridge arms and choke coil for any transmission losses which might occur. The mechanism for achieving the astonishing feat of sending and receiving separate telegraph messages at the same time on the same line wire, depends upon very simple principles of electricity and magnetism, although in practice numerous complications arise. The greatest obstacle is overcome by proper balancing. This is the act of arranging the artificial line so that any current passing through the bridge arms must traverse lines of equal length, electrically speaking. The polar duplex operates on two sets of batteries of opposite polarity, connected to the line through a pole changer so constructed that only one set of batteries is on the line at one time, the opposite pole of which is grounded. This pole changer is controlled by a key and relay which by making and breaking the circuit alternately connects first one polarity, then another to the line. As can be seen by the drawing, in a normal state with the key open, negative battery of each station is connected to the line. There is consequently no difference of potential in the line wire; both sets of batteries being of like polarity all electrical impulses are neutralized. There is, however, a current flowing in the artificial line, from the positive pole of the negative battery through the ground and back through one of the bridge arms to the negative pole. There is no current flowing in the polarized relay."

"The polarized relay used in this circuit is differentially wound, but is polarized through the connection of the

double core with the south, or negative, pole of a permanent magnet. The vibrating armature is suspended from the north, or positive pole of the same permanent magnet. It can be seen that when no current moves through the coils, both cores being magnetized negatively by induction exert exactly the same pull on the armature, which does not produce any deflection in it."

"In the actual transmission of a message, when the home station depresses its key an impulse is sent out and divides equally in the bridge arms, one half going to line and the other half through the artificial line. As this produces no difference of potential across the polar relay and consequently does not energize its armature, the positive impulse is transmitted over the line to the distant end. Supposing the distant end key is normal, leaving negative battery in line, the positive battery in the line wire flows across the polar relay to the current flowing in the artificial line referred to before; this operates the polar relay and produces the desired signal at the distant end. If the operator at the distant end desires to transmit a message at the same time, closing his key to do so, he throws positive battery out on the line. In this case there is positive battery at both ends in the line and artificial line, neutralizing all impulses, consequently the positive battery of each station flows through its own polar relay and produces by its own polarity the exact signal and produces it from the distant end. Thus, no matter what position the key at either end may be in, they receive only the signals intended for their office. In this same way, it makes no difference what length or variety the impulses at either end may assume, as they are exactly recorded at the distant end, first by one combination, then the other."

"The railway composite, as outlined before, is merely an instrument or series of instruments added to a telegraph line, to allow the usage on this line of telephone conversations, these conversations to be carried on simultaneously with the telegraph. This system requires the following arrangement: At each terminating station of the telephone there must be what is known as a terminal differentiator, which is an impedance coil placed in series with the line, and a condenser wired from the ground to the line. The telephone sets are wired so that they are between these pieces of apparatus at either end. By placing the telephone instruments in this way they are practically on a line by themselves, for the impedance coils choke all inductive disturbances on that part of the line ahead of the instruments, and also offer such an amount of self-induction to the high frequency voice currents, that they do not attempt to flow back through the coil. The telegraph currents flowing in the main line are prevented from flowing through the telephone instrument to ground or causing any disturbances in the telephone by the condenser which is wired in series between the line and instrument. All way or intermediate stations are provided with a condenser which shunts the telegraph key and relay, and the relay itself is separately shunted by a 1,000-ohm resistance coil. This condenser affords a path for the voice currents, and also prevents the high frequency ringing currents from chattering the telegraph relays by affording a path of ohmic resistance only, which the ringing and talking currents readily take in preference to the impedance of the telegraph relay."

"Figure 44 shows two terminating stations and one intermediate station and also shows the detailed connections of the instrument. Each set consists of an ordinary

local battery talking circuit, that is, transmitter, receiver, induction coil and switch hook. For signalling, each station is provided with an interrupter which produces an interrupted current of very high frequency, and for receiving it is equipped with a resonating howler which is operated by this interrupter."

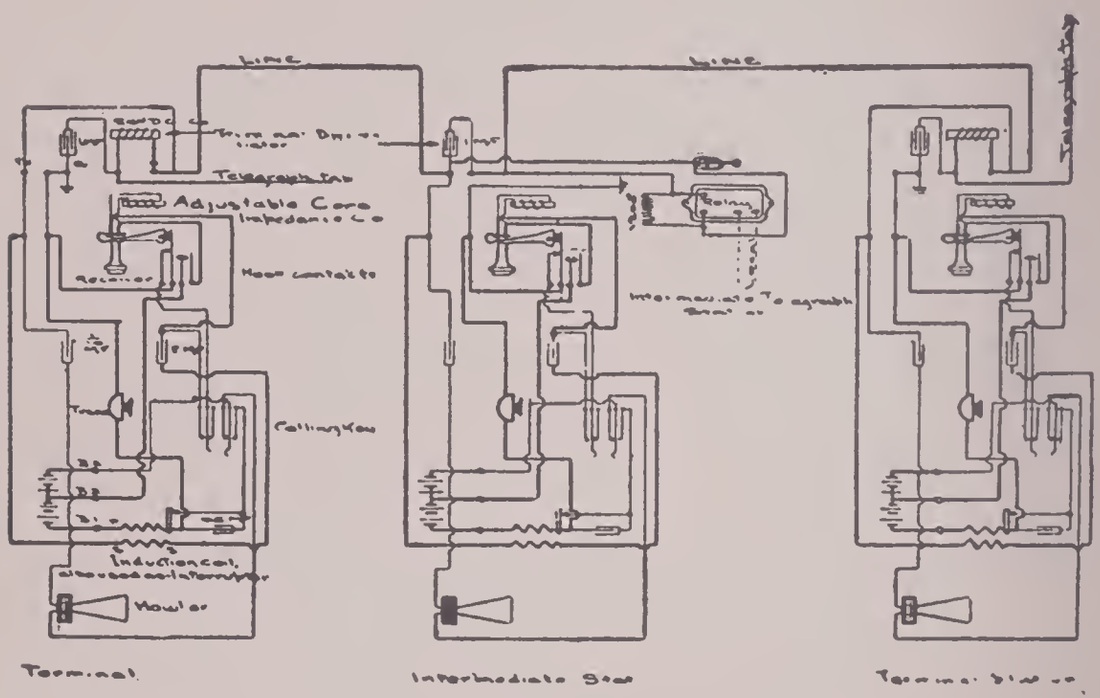


Fig. 44.

"One of the features of this set and circuit is the new arrangement of using the same coil for both talking and signalling. In a conversation it is used as an induction coil, and when the push button is depressed for ringing it is converted into an interrupter. This makes a very compact arrangement and does away with a special interrupter, which would otherwise have to be used. Heretofore it has been necessary to receive the high frequency ringing currents with a relay and bell, the relay for responding to the high frequency currents and closing the local circuit on a vibrating bell to sound the signal. By

the introduction of the howler, these have both been done away with, and the intensity of the calling sound much improved."

"In this system, for escape currents, which would produce noise in the receiver, there is an impedance coil bridged around the receiver with an adjustable core, so that by varying the core, the amount of impedance in the receiver can be either increased or diminished, and consequently the amount of noise can be made to vary."

"The induction coil used is a regular induction coil, with a cone-shaped piece of solid iron about a half inch long, stuck into the core at one end. This acts as a core for the buzzer; when the coil is so used, the primary winding is the magnetizing coil, a small pair of contacts are added at this end to perform the service of an armature, and by an arrangement of connections as shown in Figure 44, when the push button is depressed we have a buzzer instead of an induction coil."

GENERAL RULES FOR MANAGING RAILWAY STATIONS

GENERAL RULES COVERING THE MANAGEMENT OF RAILWAY STATIONS.

The Agent. The business of a railway station is usually placed in charge of a station agent who is under the immediate direction of the superintendent. For faithful service and safe keeping of the company's property and money, he must give satisfactory bonds, the amount varying according to the importance of the station. He must strictly observe the rules and regulations covering the business, see that the employes at the station properly discharge their duties and that all treat the public with courtesy. He should make himself thoroughly familiar with the rules of his company, particularly with those relating to his own duties. He must divulge the business affairs of his company to none but the proper officials, but should at all times cheerfully give to the public all information to which it is properly entitled.

Authority of Agents. The agent has control of the station-house, sidings and other property of the company, is held responsible for the general oversight of the same and employes connected therewith. He is also held responsible for the care and safety of all property of the company and should see that all records and tariffs are properly filed for convenient reference.

Authority at Large Stations. At large points, the different departments are given in charge and controlled separately by a ticket agent, freight agent, baggage master and yard master. They are all more or

less under the charge of the superintendency of the station agent, the authority varying on different roads.

The Yardmaster. The yardmaster is under the direction of the superintendent and has charge of the yard and sidetracks of stations where trains are made up, the movement of trains therein, and the yard force employed at those points. In the absence of the yardmaster the duties of that official are usually performed by the agent.

At Smaller Stations. In addition to other duties the agent at smaller stations usually acts as telegraph operator, express agent, and baggage master, etc., etc.

Absence from Duty. Unless by special permission from the superintendent, agents are not allowed to absent themselves from duty or leave their stations in charge of others.

Classification of Station Business. The business which comes under the supervision of the station agent may be divided into four separate departments, viz., "Freight," "Passenger or Ticket," "Telegraph" and "Baggage." "Express" may be added on some roads, the agent at smaller stations on most roads acting for the Express Company.

Tariffs in Force. Tariffs are effective until superseded by the issuance of another tariff or by regular cancelling or by cancellation through limitation.

Conducting Correspondence. Communications should be given prompt attention, and when received from patrons or prospective patrons of the company relative to rates or other matters, should be answered courteously and as fully as the circumstances demand. When communications are addressed to the different general of-

fices, the printed envelopes usually provided should be used. In other cases care should be taken to see that the envelopes are correctly addressed.

Routing. When so requested by shippers or passengers, agents should give information regarding the various routes with which his company's line connects, but should not endeavor to influence them in favor of any particular route, excepting that preference may be given to the "through route" which will give the longest haul to his company, at the same time serving equally well the interests of the patron.

FREIGHT FORWARDED.

Freight Forwarded. When offered to them by shippers, station agents must receive goods and give the proper receipts for all goods in good shipping order, plainly marked, except articles which are prohibited by the rules of the company. When giving receipts for cars loaded by shippers, the receipt should read, "Shippers count——" "More or less," except where the correct amount, etc., is positively known by the agent. Releases for household goods and for freight of a smaller character should be taken in duplicate.

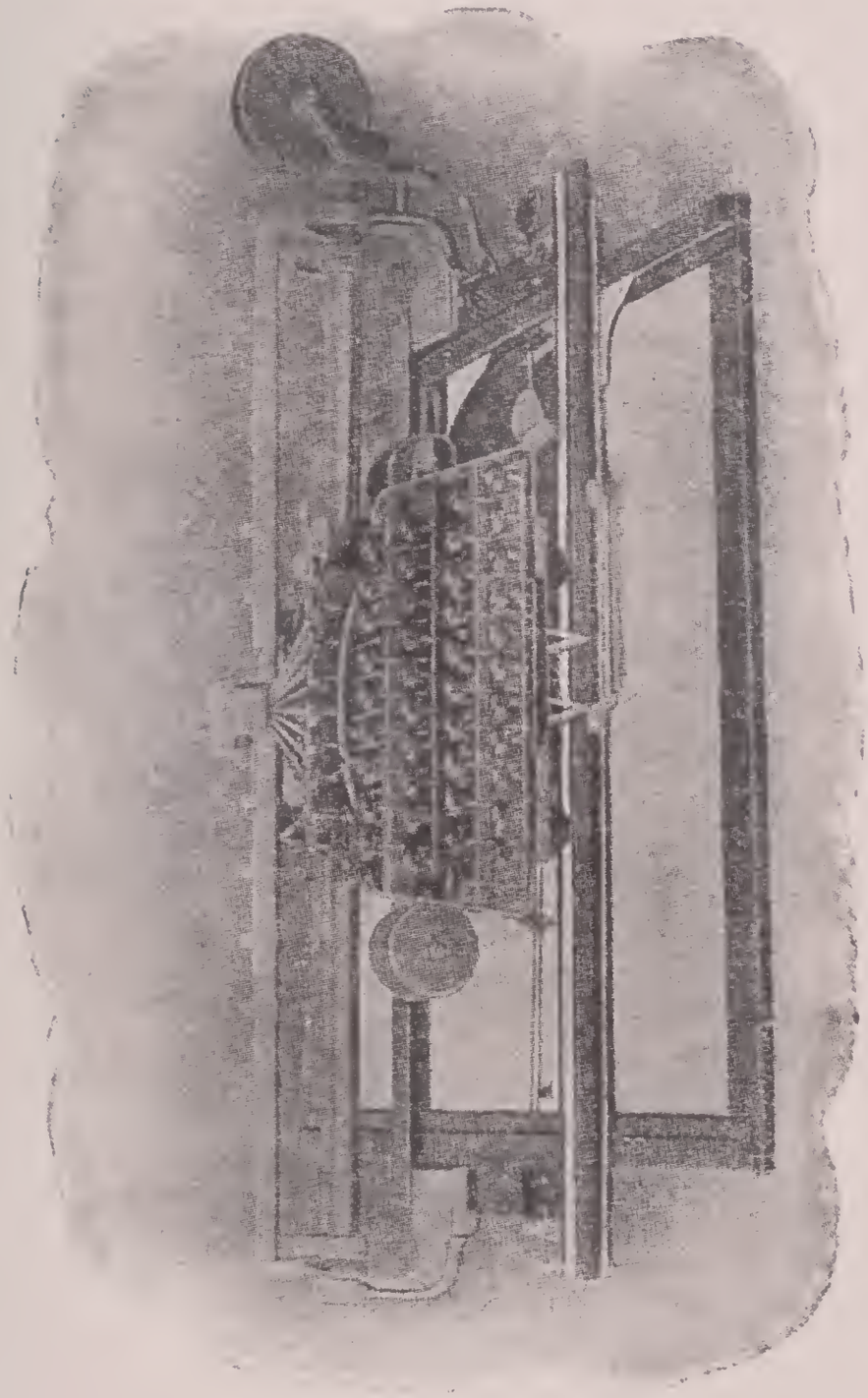
Shipping Bill. When freight is offered for transportation a shipping bill giving written shipping directions must be taken which should be signed by the consignor or his representative when the freight is delivered at the depot. The agent or tally man who receives the freight should tally same, checking each item on the shipping bill and sign his name under the check marks made by him after making notation "tallied when re-

ceived." Freight received from connecting lines should be treated in the same manner.

Way-Bills. On all freight forwarded from a station, way-bills must be made out and delivered to the conductor of the train taking same. Separate way-bills must be made for the contents of each car, and also for goods destined to different stations. A way-bill is a blank form printed so as to admit of the insertion of a detailed record of every consignment of freight. Special conditions should be noted on the way-bill. When perishable property is being shipped, the words "perishable freight" should be noted in red ink on the outside of the way-bill. The agent should know by examination and count that he actually receives all freight for which he gives a receipt. He should also know that the marks agree with those indicated on the shipping bill and that the goods are correctly described. General terms such as "merchandise" or "grain" must not be used. When the same kind of freight is in packages of varying sizes the number and weight should always be shown.

Way-Bills, How Made. The following essential details should be shown on way-bills: The car initials, car number, way-bill number, date when forwarded, name of the station from which forwarded, name of the station at which goods are to be delivered, name of the consignor and consignee, the rate, and a full description of all articles shipped and other particulars, all of which should be entered in the freight forwarded book. Conductors should enter their names in proper place on way-bill for freight hauled in their trains.

Copies of Way-Bills. Way-bills are generally written with copying-ink and an imprint of them taken on



Modern Way-Billing Machine.

tissue sheets, although at some of the more important stations, in large cities, billing machines similar to the typewriter are now used. At smaller stations, copies of way-bills are usually re-written in a record book. The regulations vary on different roads in regard to the forwarding of duplicate copies, but as a rule duplicate copies must be forwarded to the proper official at the general office.

Freight Received. The agent should critically examine the way-bill delivered with freight from other stations to ascertain if all footings, etc., are correct.

Notifying Consignee. Agents should notify by postal card or otherwise the consignee when freight arrives at a station, giving the amount of the charges.

Refusing to Accept Freight. If a shipper refuses to comply with the company's rules, the agent should explain that only by compliance with the terms and conditions as set forth in the classification tariffs and general rules may freight be accepted by him for transportation. If the shipper persists in refusing to comply, the agent will be justified in declining to receive freight, but in such a case he should immediately notify or advise the General Freight Agent, stating the particulars.

Owner's Risk. Freight for shipment to prepaid stations is accepted at owner's risk of loss or damage after it is unloaded at destination. "O R" meaning Owner's Risk, must be marked on receipts issued for such freight unless a special rule is in force applying to same. Household goods are transported at a cheaper rate only when released to $5.00 per hundredweight (cwt.). When it is shipped the bill should be marked "O. Rel. Val. $5 cwt." or "O. R." notation should be made by the shipper under the shipping bill, never by the agent unless by

(Form 1830-A Beg.-Old 83 Beg.)

The Atchison, Topeka & Santa Fe Railway Company.

SERIES — WAY-BILL

U. P. No. 24762

From CHICAGO To FT RILEY KAS Date DEC 17 190 2

ROUTE: VIA JUNCTION — KAS CITY WITH; VIA JUNCTION WITH; VIA JUNCTION WITH

Weigh at ____ Stop at ____

MARKED CAPACITY OF CAR LBS. ____

FOR ____

WEIGHED AT NT WD

Gross ____

Tare ____

Net ____

CAR

INITIAL	NUMBER	TRANSFERRED AT
N Y C	54156	

Transfers & Reweighs

*When a through rate is used and the shipment is to be re-way-billed en route, the subdivisions must be shown in the rate column in road order, noting opposite each proportion the initial of the road to which it accrues.

CONSIGNOR Connecting Line Reference Original Car and Way-bill Number and Point of Shipment	MARKS CONSIGNEE AND DESTINATION	No. of Packages	ARTICLES AND CLASSIFICATION CONDITIONS (O R, C R Rel Gtd., etc.)	WEIGHT	Rate and Authority*	FREIGHT	ADVANCES	PREPAID	FREIGHT BILL NO.
UNION LINE 12/9 42 JERSEY CITY	C A STEADMAN	1	DESK BXD	190	103 5				
			O R		22				
					110				
					132	2 51		2 51	
BUTLER BROS	ORDER	1	BDL WHIPS	20	195	39			
	BUTLER BROS	3	BX TINW NSTD	215	110 5	2 38			
	NTFY	1	BX STPD TINW NSTD SLD	150	82	1 23			
	C W MERRITT	1	CRT AXE HDLS	50	60	30			
			O R						
			DELIVER ON B/L ONLY	625		6 81		2 51	

Agents at Junction Stations receiving this Way-bill from Connecting Line must stamp in spaces below, in consecutive order, the names of their stations and date upon which the Way-bill is received.

1	2	3
Stamp of Junction Forwarding Agt.	Stamp of Junction Forwarding Agt.	Stamp of Junction Forwarding Agt.

Conductors must enter in space provided on back of this blank number of train, station taken from and left at, date and signature.

AGENT AT DESTINATION

WILL ENTER HEREIN THE

DATE REPORTED.

Leave this Space Blank for Binding.

CARD WAY-BILL MUST BE ATTACHED (NOT PASTED) TO THE REGULAR WAY-BILL BEFORE SENDING TO AUDIT OFFICE.

WAY-BILL WRITTEN BY WAY-BILLING MACHINE.

special instructions. The attention of the shipper should be directed by the agent to the difference in rates when carried at "Owner's Risk" and "Carrier's Risk."

Refusal by Shipper to Sign Releases. If shipper refuses to sign a release the agent must collect the charges (prepaid) to destination only at the increased rates for shipments not released.

Except when shipper has an annual release, all freight so described under classification, to be released, is subject to release. When shipments of perishable freight are made from a given point, an agent may obtain from the shipper an annual release in duplicate, forwarding original copy to the freight auditor and retaining duplicate copy for his business record, and when accepting freight for shipper having such annual release, a notation to the effect that an annual release applies thereto, should be noted on the shipping bill, bill of lading, waybill and receipt. Agents must refuse to accept or forward freight if offered by a connecting line without release until the necessary conditions have been complied with. The requirements of all release contracts must be fully and properly made out when forwarding freight.

Perishable Property. Property, liable to damage by the weather, when offered for shipment to points at which the company has no refrigerator car service, should be declined and the shipper referred to the express company. When shippers insist upon forwarding same as freight, agent should accept it only upon condition that the entire risk of damage is assumed by the shipper. The agent must in such cases properly secure a release for such freight, using the prescribed form. When perishable property is accepted for transportation, it should be taken only upon payment of the freight charges to

destination or upon a guarantee of the charges, in writing, from a responsible party. All goods of doubtful value or perishable should be guaranteed when not prepaid. When a special blank is not provided to meet such cases, it will be sufficient for the agent to write "charges guaranteed" on the bill of lading or other receipt given the shipper. Agents should be careful not to accept guarantees from irresponsible parties, because if not paid, the agent is held responsible for such guarantees. Connecting lines delivering freight upon which the charges should be guaranteed are required to comply with the regulations covering the guarantee of such freight and all such guarantees should be made in writing. It is not sufficient for an agent to accept the guarantee of the original shipper when freight is transferred from a connecting line to his own. Before forwarding freight from a connecting line, agent should demand the regular freight bills and should not receipt for freight when accompanied by bills bearing such notations as: "Memorandum bill," "Regular bill to follow," "Weight and numbers to follow," etc. If an agent discovers the marks on packages differ from those in the bill as to the name of consignee, destination or route, he should hold shipment, at once notify the shipping agent of the discrepancy and ask him for correct directions for delivery. In the case of perishable freight, when there is no time to obtain a reply by mail, he should communicate the particulars by wire.

Transferring Freight to Other Cars. When freight is received or "set out" to be transferred into other cars, the number and initial of the car to which the freight is transferred should be noted in ink on the waybill and the agent making the transfer should sign his name in full. Any difference in the tallying should be

noted in the way-bill, also the original car number, as well as number of the car into which the freight has been transferred should be shown. If the shipment is in carload lots or is made in through cars and so are not checked or transferred the way-bill should show a notation to that effect.

"Mem" Bills. These are used in billing cars of company's material when the agent has had no time to make a regular bill. When used, regular way-bills should follow by first mail to station to which the shipment was consigned as shown on the "mem" or card bill. These should show the numbers and initials of cars, destination, name of superintendent or other official by whose authority they were way-billed and the signature of the agent at station from which the shipment originated.

"Over," "Short" and "Damaged" Reports. Regular forms are furnished for the purpose of making these reports which should be filled out and forwarded promptly in accordance with the printed instructions given on each. The agent should advise the freight claim agent when such "over," "short" or "damaged" claims have been properly accounted for, rectified or disposed of. The freight claim department number, known as the F. C. D. number, should be shown on the stub at the bottom of the "over," "short" or "damaged" report, which is torn off and returned to the agent, showing the number by which such report may be identified in the office of the freight claim agent. When these stubs have been received from the freight claim agent by the station agent, they should be written in the "over," "short" and "damaged" copying book and the stubs fastened over the reports, in that book, to which they refer.

Over-charge, Loss or Damage. Claims for over-charge, loss or damage should be immediately forwarded to freight claim agent together with an itemized bill of the claim, bill of lading or shipper's receipt given for the shipment. The original freight bill and original invoice, copies of way-bill and all notations thereon, duplicate copies of short or bad order reports and any and all information which the agent has or may be able to obtain in relation to the claim. If the claimant declines to hand over the original invoice, the agent should examine it, and then certify that the claim is made at the invoice price. When a claim has been presented for freight lost, which is afterwards found, the freight claim agent should be notified.

PASSENGER OR TICKET DEPARTMENT.

Ticket agents or station agents in charge of selling tickets at stations are required to furnish all necessary facilities to passengers for the purchase of tickets. They should have their offices open at least half an hour prior to the departure of each train carrying passengers. The tariffs, circulars, books of instruction, time-tables and other equipment should be kept in methodical order, ready for instant reference or use. Ticket agents and agents in charge of selling tickets should be well informed regarding the time of trains scheduled to carry passengers, routes, fares, and available connections. They should study the various kinds of tickets and their arrangement in the ticket cases, the circulars and other information regarding fares and the tariffs. They should also be thoroughly familiar with the map of the railroad and also with the contents of the manual or book of instructions issued by the company.

Classification of Tickets. Tickets may be classed as follows: First class, second class, local or coupon, half, commutation, excursion, special, interline, and mileage-books. Tickets are local when used only on the line of road which issues them. They are interline when used for a continuous journey over more than one railroad. Fares are quoted in the various tariffs known as local tariffs and interline tariffs, both joint and individual. "Observance of tariffs, rates and regulations is required, both as a necessity of proper accounting and in compliance with the interstate commerce law and similar state laws."*

Coupon or Interline Tickets. A coupon ticket is one having two or more coupons. It may be local or interline. Interline tickets are first and second class colonist, settlers, immigrant one way, round trip tourist, home-seekers, excursion, special excursion for meetings, holiday excursion, etc. They have a form of contract with provision for limitation by "punch-out" in the margin. Sometimes a space is provided for the signature of the passengers, sometimes for a description of the passenger by punch holes.

Dating Tickets. Every ticket sold, regardless of its form, should be plainly stamped on the back with the date of sale, stamped or perforated with the dating machine or stamp provided for that purpose. When interline, coupon or tourist tickets are sold, each coupon and also that part of the ticket containing the contract must be thus stamped: "Agents should be particularly careful to change the date of their dating stamps, before commencing the sale of tickets for trains

*Meyer.

leaving after midnight, thus insuring the proper legal date from midnight to midnight of the day on which the ticket is sold."*

Writing on Tickets. When it is necessary to write on tickets it should be done with pen and ink and the writing should be plain. The name of the station should be followed by the name of the state on account of the similarity in the names of stations in various states. When a mistake is made in writing, punching, stamp or otherwise, alterations should not be made on the ticket, but a new one should be issued properly filled out and stamped. The spoilt one should be marked "Void," by writing that word across the contract and each coupon, and sent to ticket auditor with a report.

Supplies. Agents should watch their stock of tickets closely and always keep on hand a sufficient quantity of active forms. When making a requisition to the general passenger agent it should be done in good time, at least ten days in advance of possible needs. A separate requisition should be used for the different kinds of tickets required.

Arrangement of Ticket Cases. Forms of tickets for temporary use for special occasions only, should have a special place in the ticket-case convenient for any unusual demand liable to occur. Tubes are usually provided in case for card tickets, the arrangement of which may be either alphabetical or geographical. Hooks are provided for simplex, coupon or similar tickets and these are usually kept in numerical order of their forms, although some roads desire them kept by other arrangement. Interline tickets are kept either in numerical order by their form numbers or alphabetical by name of terminal line as shown in charts or forms.

Responsibility of Agents for Tickets. Tickets furnished to an agent are charged to him. Therefore the utmost care should be taken to prevent loss. The ticket-case should be kept locked, and never opened except for the sale of tickets or for checking purposes. Much anxiety and trouble may be avoided by care being used to not mislay tickets and to properly care for tickets marked "Void" and to guard against tickets falling down at back of case and being lost. It is a safe plan and one usually followed by careful agents to keep in the safe such tickets as mileage-books, excess-baggage—book-tickets, commutation tickets, prepaid orders, etc.

BAGGAGE DEPARTMENT.

Baggage. The term "baggage" should be applied only to passengers' personal effects, consisting of wearing apparel and other things necessary for their journey. For each full ticket, the weight limit on nearly all roads is 150 pounds. Weight in excess of 150 pounds must be charged for as "Excess baggage" at the prescribed rates as given in the tariff.

Baggage, How Packed. Personal effects and wearing apparel of passengers should be packed in trunks for checking, although valises, satchels, suit-cases and leather hat-boxes may be received and checked. Sometimes camp equipages, the properties of theatrical companies, emigrant effects packed in bags, also sailor's bags are offered as baggage for checking, and if securely fastened may be accepted and checked. If, however, trunks, satchels or other articles have bundles tied to them or if two pieces of baggage are fastened together with a rope or strap they must not be checked until separated.

Examining Baggage Before Checking. Before giving checks for baggage, examination should be made to see whether locks or hinges are broken or missing, or locks unfastened. If baggage is found in a condition which renders it risky for transportation, it should be rendered as safe as possible by the passenger, the baggage-master or agent assisting when practicable. Such baggage is known and described as "Bad Order" and should be so designated against its number in the daily report.

Transferring Baggage at Junctions, etc. Baggage transferred at transfer points should be examined; if found in bad order, the attention of the person from whom it is received should be called to its condition and the customary notation made in the daily report. Special reports in writing of "Bad Order" baggage on the prescribed form should likewise be made to the general baggage agent.

Baggage Destined to Stations Without Agents. When baggage is checked to "no agent stations" the passenger should be informed of the fact that as no agent will be at destination, the train baggage-master must have checks given to him before train arrives in order that he may put off the baggage. It should be explained that without such surrender of checks the baggage would be carried to the first station beyond at which there is an agent.

Baggage "Over" and "Short." Baggage "over" or "on hand" for any reason should have an ("on hand") "O. H." tag attached thereto, showing date, train, and conductor, from whom received, also the number of the over, short and damaged—("O. S. & D.") report made regarding it.

If baggage is "short" when duplicate checks are of-

fered, the letters in full, numbers, date of issue, and station issued at, route, etc., should be immediately telegraphed to the general baggage agent. When baggage so reported is subsequently received, the general baggage agent should be notified.

Monthly Reports of Baggage. Monthly reports vary in detail. Different roads have different requirements; generally speaking, however, a monthly report shows the number of pieces of baggage received and forwarded and total amount collected for excess baggage. Sometimes the report provides for comparison showing increase or decrease with the corresponding month of the previous year.

Unclaimed Baggage Reports. Reports which describe the kind of baggage, marks, check numbers, destination, etc., on hand unclaimed, should be made weekly to the general baggage agent. This report is usually made to also cover what supplies of stationery, checks, etc., are on hand.

Responsibility for Baggage. Agents and others who have the handling or care of baggage cannot be too careful. Many claims for damage and loss which railway companies have paid might have been prevented by the exercise of more care on the part of those responsible. Baggage should be put in the baggage-room, directly after delivery from train, if left on platform it should be watched. Passengers, expressmen, hackmen and others should not be permitted to remove checks from baggage. By exercising due precaution loss of baggage through pieces being taken away by mistake or by theft may be obviated. Before delivery checks must be correctly matched. No person not having business there should be allowed in the baggage room and when the agent or per-

son in charge is absent doors and windows should be closed and securely fastened.

NOTE:—The following rules are in force on the Chicago & Northwestern System. They cover the essential points which all companies require of their agents. Each company has its own rules, but with a few minor differences, necessary because of local conditions, they are much the same.

"Station agents are not allowed to be absent without leave from superintendent, except through illness, in which case they must immediately inform superintendent and arrange for some competent person to discharge their duties."

"They must at all times see that their offices, waiting rooms, freight houses and platforms are kept in a clean and orderly condition; that all grass, straw, or other combustible material is promptly removed from depot grounds and premises; that stock yards are kept in good order and ready for use, and that closets receive the same careful and daily attention as waiting rooms and offices."

"Agents will be held responsible for the position of switches and cars at their stations. Switches must be set and locked for the main track, except when in use. Agents must know before leaving their stations at night that all switches are locked for the main track, and that cars have the brakes set or are otherwise secured, so that they cannot be moved by the wind, or their position changed so as to interfere with the passage of trains on the main track."

"Keeping switch and semaphore lights in good condition is of the utmost importance. To this end agents

will have them taken down every morning, refilled, the lenses carefully cleaned, and put back in the evening. They must be kept under cover when not in use."

"They are required to use every effort to secure the prompt dispatch of cars, and will have way-bills ready promptly, so that trains will not be delayed. They must see that empty, as well as loaded cars, are taken by trains at the earliest possible moment, subject to order of the train dispatcher."

"Whenever any company material in carloads is received at any station, for which there is no disposition, agent will report them to chief train dispatcher at once, by wire, giving contents and any other information he may have, so that it may be arranged to have them unloaded promptly."

"Through freight must not be loaded into a car containing freight for way stations, except where it is absolutely necessary."

"Give particular attention to the loading and unloading of stock. Agents will render all possible assistance in loading and unloading of stock, and must see that cars are in proper condition, and that doors are securely fastened before leaving station."

"In loading hay, straw, tow and similar freight that is liable to catch fire, agents will be particular to select tight cars and see that all openings are closed and securely fastened. Such cars must be distinctly marked with the card that is furnished for that purpose, one card being placed on each side of car."

"Agents are required to see that cars are properly loaded, to obtain, if possible, the maximum capacity, and not permit an overload to exceed ten per cent of marked capacity. It is important that load be distributed evenly,

securely staked and that no projections extend over ends of cars."

"No agent is excusable for allowing perishable property to spoil on his hands. When such property is received and is refused or unclaimed by the consignee, notice should be sent to assistant claim agent by wire of that fact; and forward to him by first train copy of the way-bill for the freight, together with report as to value of property and why same is refused, or, if unclaimed, state whether consignee's whereabouts is known to agent, and name and address of shipper, if known."

"Freight, baggage and other articles must not be allowed to stand upon depot platforms where they might cause accident or inconvenience to passengers or employes, or receive damage from weather."

"Agents will not allow a car to stand upon main track to be loaded or unloaded without special permission, in each case, from superintendent."

"Agents will see that conductors of freight trains do not block public crossings longer than five minutes."

"Agents will decline to allow any boards, posters or advertising matter to be placed on the company's cars, except such cards as are furnished by the company, as "time freight" cards, or cards of direction. At destination and at junction stations with other divisions, or foreign roads, agents will remove all advertising matter that is not authorized by the above or by special instructions."

"Agents must keep doors of their freight houses closed and securely locked at all times when proper employes are absent. They will not permit delivery of any freight except in the presence of themselves or representatives."

"Tickets must not be sold for stations at which trains

do not stop, or for trains that do not carry passengers."

"Tickets must not be sold to persons not in condition to care for themselves, unless accompanied by a proper person, nor must tickets be sold for excursion or extra trains unless so authorized."

"Ticket offices must be open at least thirty minutes before arrival of trains that stop, and kept open until trains have passed."

"Station agents, who also act as agents of any express or other company, must give preference to duties of the business pertaining to the railway company."

"Agents will promptly advise superintendent, either by wire or mail, of any unusual events that have occurred in their neighborhood, which are of general interest or importance, such as fires, disasters, deaths of prominent persons, etc."

"Agents will familiarize themselves with and obey instructions of other departments."

STATION REPORTS.

RETURNS FROM LOCAL FREIGHT STATIONS.*

The returns from a local freight station may well be divided into two classes—regular and irregular. The regular reports cover such transactions at the station as are strictly in accordance with the company's rules and regulations, and are necessary for the proper accounting of earnings; the irregular reports cover such special conditions or happenings as are not anticipated in the general rules, and which have or are likely to have a bearing on

*As described in "Railway Organization and Working."

the business of the company. Under this head of irregular returns might also be placed those reports which are only too regular in the frequency with which they occur, but which would not be necessary under ideal conditions. Such as "bad order" reports and the like.

REGULAR REPORTS.

To the General Auditor. Agents are required to balance their cash-books which show all cash transactions of their respective stations, and to send cash not needed to make change to the Treasurer daily. These remittances are reported to the General Auditor for the credit of the stations from which they are received.

The station accounts are balanced weekly, and a balance-sheet, together with a detailed statement of all amounts taken into the week's account under the head of "storage, switching, etc.," is sent to the General Auditor. Any corrections which the agent has found it necessary to make in his accounts must be shown on the balance-sheets, so that only the net balance chargeable to the station will show in the totals. A monthly balance-sheet and statement of "storage, switching, etc.," is also sent to the General Auditor. "Storage, switching, etc.," includes switching, storage, car service, icing charges, rents, and other miscellaneous charges remitted to the Treasurer for credit to the station.

When an agent is duly authorized, on account of freight having been overcharged, taken for company use, etc., to make delivery upon collection of less than the full amount carried in his accounts against it, the balance must be carried on the balance-sheets as "awaiting voucher," and a statement made on the back of the

balance-sheet, showing from whom, for what amounts, and for what accounts vouchers are so claimed.

Such part of the balance against an agent as is uncollected because freight is short or on hand, is carried on the balance-sheets as "uncollected bills for charges on freight," and details of this amount are shown on the back of the balance-sheet.

Freight to be transported for the United States Government is not accepted unless accompanied by original and duplicate bills of lading issued by the Government; and as collection of charges on this freight is generally made through the office of the General Auditor instead of at destination, the bills of lading are handled with the same care as so much cash. The duplicate bill of lading must be surrendered to the government consignor, and the original sent by express to the receiving agent, who, upon delivery of the goods, sends to the General Auditor the receipted expense bills, bills of lading, and a recapitulation showing the amount of charges on each, the total of all, and the date of balance-sheet upon which he will take credit. These receipted expense bills are received by the General Auditor in lieu of remittances in favor of the credit of the station delivering the goods.

To the Freight Auditor. The first rule to agents, in regard to their returns to the Freight Auditor, usually reads: "Under no circumstances must an agent forward freight of any kind without making out and reporting to the Freight Auditor a regular waybill covering it." The waybill constitutes the most important return to the Freight Auditor, and nearly all reports made to him are based upon it.

Copies of all way-bills, both local and inter-line, are sent daily to the Freight Auditor by the billing agent,

and the receiving agent sends to the same official all original waybills on hand at his station which have been checked and found to be correct. The original waybill is invaluable to the Auditor of Freight Accounts, as these documents form a veritable history of the shipments which they cover during the time of transportation, and by examination of the bill the Auditor can tell whether or not the company has performed its duty to the shipment and received its rightful compensation for the service.

When baggage is carried on freight trains, it moves on a freight waybill, the regular free allowance being made in the weight and the balance charged for at the rates shown in the baggage tariff. If the charges are paid in cash either at the billing or at the receiving station, notation to that effect is made on the waybill; but if paid by excess-baggage coupons, the receiving agent makes a copy of the waybill and forwards the same, with coupons attached, to the Freight Auditor at the close of the month.

The agent makes a weekly report to the Freight Auditor as follows:

1. A report showing the total amount of freight charges on all waybills received during the week (*a*) from stations on his own line, (*b*) from stations on foreign lines, and (*c*) total received freight charges per weekly balance-sheet; also, total forwarded freight charges on waybills made to stations on foreign lines.

2. A report of all inter-line waybills received from points on foreign lines, and of all inter-line waybills made to points on foreign lines.

3. From junction stations only, a junction freight report of all inter-line waybills from stations on a foreign

line over his line to stations on another foreign line, his line being intermediate.

4. From junction stations only, a junction freight report of all inter-line waybills to and from stations on his line, received from or delivered to connecting lines.

5. Junction agents are also required to make reports of any miscellaneous charges made in waybills delivered to connecting lines, if those charges were made after the bill left the forwarding station.

6. A report, from milling and cleaning in transit stations, of all waybills on which milling or cleaning in transit charges have been collected. Original waybills on which transit rates have been collected must be returned weekly to the Freight Auditor with the transit reports in which they are included. Transit reports are made separately for each miller or cleaner and for each kind of grain. They show the amount of each kind of grain received at the station, and the amount of product of each kind forwarded on free billing account of transit rates.

The agent makes a monthly report to the Freight Auditor as follows:

1. Separate reports of all local waybills received from and made to stations on his line and not included in a previous monthly statement. All errors discovered and corrected before the monthly received report is rendered, are taken into account in making this report. The fact that a waybill has been sent to the Freight Auditor or included in a weekly received report, does not render it too late to make a correction, provided the waybill has not been included in a previous monthly report. Waybills must be included in freight reports at the corrected figures.

2. Separate statements of inter-line way-bills received from and made to stations on foreign lines during the month.

3. Separate recapitulations of stations from which bills have been received and of stations to which bills have been made, showing totals of tonnage, freight charges, advanced charges, and prepaid charges.

4. A report showing the weight and freight charges on the several commodities forwarded and received.

5. Switching and car-service charges are accounted for in the report for the week in which they accrue. The report of switching charges collected must show the date of switching, car numbers and initials, points between which switching is done, commodity, name of party from whom collection is made, date collected, and the amount of charges on each car.

The report of car-service charges collected must show the date of detention, name of party from whom collection is made, car number and initials, whether car is loaded or empty, rate per day, and the amount collected on each car; also state of weather, a matter affecting the charges.

The report of storage charges collected must show date of collection, name of party from whom collection is made, reference to the waybill on which the material was received, basis of charge, and the amount collected.

The agent at a junction station, where foreign lines perform switching for his line, forwards monthly to the Division Freight Agent a statement showing in detail the service performed by each line, and opposite each car number must make reference to his report, covering "storage, switching, etc.," to the Freight Auditor. At junction stations where switching is performed for other

lines in accordance with agreements between the roads and orders received from the connecting lines, a report of the service is made to the Superintendent, who prepares bill to cover. A copy of this report is sent to the Division Freight Agent.

To the Fuel Accountant. Agents at coaling stations make reports weekly to the Fuel Accountant of coal received, coal delivered to engines, and cars rebilled. Monthly they forward an inventory of coal on hand, cars on track, and a balance-sheet. Where coal is delivered to engines working on two or more divisions, a separate report must be made for each division.

To the Car Accountant. The agent makes a daily report of all cars received at or forwarded from his station and on hand. Cars on hand must include all cars regardless of what service they may be in, and must be carried on the reports every day while at the station. Junction agents, in addition to the above, must report daily all cars interchanged with connecting lines, whether for switching purposes or otherwise. The car number and initials, also the final destination and route of each car, must be given.

IRREGULAR REPORTS.

Attention will now be given briefly to an agent's duty under a few special conditions.

In case of loss or damage by fire to property of the company or in its possession, the agent must notify the General Manager by wire and confirm, giving kind of property, whether partial or total loss, location, date, and cause of fire.

When shippers refuse to ship goods under the terms and conditions of classification, tariff, or rules of the company, the freight must be refused, and the Division Freight Agent or the General Freight Agent should be notified.

When freight is receipted for as being in bad order, report should be made to the Freight Claim Agent.

When stock dies or is crippled in transit, the agent should call a veterinary surgeon to make an examination of the animal. The surgeon's report and bill should be sent to the Freight Claim Agent.

The Freight Claim Agent should also receive reports as follows: (*a*) when perishable freight is received and refused—the report should give the value, why refused, and the consignee's whereabouts; (*b*) when unable to find a consignee after communicating with the billing agent; (*c*) when freight has the appearance of having been tampered with; (*d*) when, after sealing and sending forward, cars are discovered unsealed and destined beyond; (*e*) when a connecting line refuses a shipment on account of improper billing, correction should be obtained from the billing agent, but if refused for any other reason, both the billing agent and the Freight Claim Agent should be notified.

Changes in advanced charges or prepaid charges should be authorized by the billing agent or the Freight Auditor, and the Freight Auditor notified when the change has been made.

When stock is shipped on contract, the original contract is sent to the Freight Auditor, the duplicate delivered to the shipper, and the triplicate kept for the agent's file.

When waste pipes on refrigerator-cars are unclean,

clogged, or otherwise in bad condition, report must be made to the Superintendent.

When freight is received on a slip-bill, the agent should notify the General Superintendent if the regular waybill is not received before the shipment.

An agent should report to the General Solicitor, by telegraph, a summary of any summons, complaint, notice, or other legal paper served on him, and should forward by mail the paper and a statement of the date of service, what the suit is for (unless disclosed by the paper), and any facts within his knowledge.

A garnishee summons should be reported to the Legal Department or to the Superintendent, giving the name of the employee garnisheed, where employed, the person under whom employed, and where he receives his pay."

RAILWAY YARDS AND HANDLING CARS

RAILWAY YARDS AND HANDLING CARS.*

"The main functions of a railway yard are to receive trains passing over the road, to separate and classify the cars for their proper destinations and to put the cars together into trains for forwarding. An important consideration is that this should be done in the most economical way, both as to time and cost, and the evidence at hand seems to show very conclusively that these results can best be attained in the "hump" type of yard. In the replies received by the committee the opinions expressed were almost universally in favor of the hump yard as compared with other types, and the advantages were summarized by one writer as follows:

" 'Hump yards, in my opinion, are very much more rapid in their work and in the handling of cars than any other types of yards in general use. If thoroughly equipped with engines of sufficient tractive power, humps of proper grades, enough riders to handle each cut of cars without delay and a proper system of marking cuts and indicating to the switchmen where they go, the yard will not only work faster than any other type, but will do it at less cost and with much less damage to the cars and to the merchandise handled in them.' "

"On the other hand, it must be remembered that the hump yard is still in its infancy as to design and in a minority as to actual numbers. Consequently an absolute unanimity of opinion can not be looked for, and this type must be expected to have some opponents. One

*From a committee report to the American Railway Engineering and Maintenance of Way Association.

objection that has been made is that cars are more liable to be damaged when handled in this way by gravity, but this is quite at variance with the experience of most of those who have had such yards under their charge. It is, of course, possible that in a yard improperly handled considerable damage might be done, but this is no argument against the type of yard.

"A hump yard is one in which the movement of cars is produced by pushing them over a summit, beyond which they run by gravity. A train of cars to be separated or classified is slowly pushed over the summit, each car or cut of cars being uncoupled and acquiring an impetus on the steep down grade which enables it to run on to the proper classification track by gravity without other assistance. A car rider or brakeman boards each car or cut of cars as it starts down the grade and controls it so as to stop it at the desired point on its tracks and to prevent damage due to cars being run together at too high a speed. The movement from the base of the summit may be facilitated by an assisting grade. Connecting or run-around tracks provide for the movement of cars which do not require to pass over the hump.

"To provide for the proper performance of its work the yard should comprise receiving tracks, classification tracks and departure tracks. The receiving tracks should be of sufficient length to hold a maximum train, and sufficient in number to receive in quick succession a number of trains which may have been detained out on the line by a wreck or other cause. This number of tracks will, of course, depend upon the amount of traffic on the road. The grade of the receiving tracks should be such that one engine can push the entire train over the hump.

"The receiving tracks are connected with the classification tracks over the hump by switches in such a way that cars on any receiving track can be pushed over the hump into any classification track. The tracks approaching the summit should be on a slight up grade to insure that the cars are closed up so that they can be readily uncoupled at the hump without causing delay.

"Hump yards can not be properly operated without riders on the cars, and in considering the accelerating grades for the hump this fact must be borne in mind. The descending or accelerating grades of the hump should be such that the cars will run by gravity from the summit to their proper destinations on the classification tracks. The exact grades must be determined by experience with the class of business handled and the local conditions. The amount of elevation and rates of grade required will vary with different kinds of cars and traffic handled, and also with the varying climatic conditions; that is to say, loaded cars will run more easily than empty cars, and the cars will run more easily in summer than in winter. The details, therefore, vary in practice in different yards.

"The tracks in the classification yard need not, as a rule, be of sufficient length to hold full or maximum trains. Their length will depend upon local conditions and the number of classifications needed. A length sufficient for half a train is usually enough, provided a sufficient number of tracks can be put in to allow of the number of classifications wanted for the different destinations and for bad-order and hold-over cars. It is desirable to keep the distance from the hump to the end of the switches as short as possible, and for this purpose the "double V" shaped layout for switches is usually the best.

"Beyond the classification tracks are located the departure tracks. These should be of full length to take a maximum train, and of sufficient number so that trains can be pushed from the classification tracks as soon as they are made up. These tracks should be provided with a compressed air plant for testing the train brakes and hose so that there will be no loss of time by requiring the road engine to do this service. In some cases the cars are made up into trains on the classification tracks, which thus serves the double duty of classification tracks and departure tracks. The tracks of a classification yard so used should be of full train length.

"The cars on any one track in the classification yard are, as a general thing, not arranged in proper order for handling in trains. A considerable amount of shifting has therefore to be done in order to put the cars in proper train order, and it has been suggested that this part of the work might be greatly facilitated by passing the cars over a second hump into the departure yard. Inquiry was made by the committee to see if this plan would be considered advisable, but the replies received were almost unanimously opposed to the use of a second hump for this purpose."

HANDLING CARS IN YARDS.*

"The office work connected with yard operations may be divided into three distinct parts: (1) "receiving," or "in-freight;" (2) "forwarding," or "out-freight;" and (3) "transfer," or receiving from and delivering to connecting lines. In immediate charge of this work is a chief clerk, who must be a man of considerable execu-

*F. S. Atkin.

tive and business ability, since he is virtually the acting superintendent many times in a day.

"1. *In-freight.* The clerical routine arising from the receiving of freight arriving in trains from off the company's lines, demands, for its handling, a force consisting of a "train clerk," "number-takers," "seal-takers," "carders," a "transfer clerk," a "grain-sealer," a "rate clerk," and an "expense bill clerk," besides, of course, the chief clerk.

"On the arrival of a train in the yard, the number-takers secure a list of the numbers and initials of all cars in the train, also noting the condition of loads on open cars—whether they are low enough to clear tunnels, bridges, etc., and whether staked on the cars, etc. All the doors—side, end, and roof—are inspected by a seal-taker, who records the seals attached to them. The seals now generally employed are made of tin, with a circular piece of lead attached. The tin band bears a serial number, and the lead disk, after a car-door has been sealed, bears the impression of the seal-punch used—either letters or numbers identifying the station where the punch is used. All of these seal numbers or letters must be taken, and a copy made in an impression-book for future reference.

"In the meantime the train clerk examines the way-bills as carefully as possible for "hold" or "diversion" orders, and makes a transcript of them on the "train-sheet," stating the car number, initial, forwarding station, destination, contents, and via what connecting line. After the train clerk has completed the transcript, a carder tacks on each car a card showing the road to which the car is to be transferred, or should it be destined for the home road, the switching district to which it is to be

taken. The train is then ready to be switched into the classification-yard.

"Some of the incoming cars may have to be transferred to other railroads, and a record of all such is kept by a transfer clerk, the expense-bill clerk making out an expense bill for every loaded car thus handled. In connection with this work, the latter clerk also sees that the bills are properly extended, and it is the usual practice for him to call back the expense bills to the clerk so as to check any possible error.

"There is a rate clerk who revises rates, or rather checks them over to see that the freight has been billed at a proper classification, and also to make sure, in case of through-bills, that his company is given its proper proportion of the through-rate. He is held responsible for all errors in wrong rates or extensions made by the billing agent.

"Where cars contain grain for inspection, a grain-sealer accompanies the grain inspector, his duty being to reseal all cars opened for inspection or samples.

"2. *Out-freight.* In the "forwarding ,"or "out-freight" work, there are, as in the "in-freight" department, the usual number-takers, seal-takers, carders, rate clerks, and clerks taking care of way-bills. As the out-bound cars are made up into trains, they are checked as before for their car numbers and initials, and all loaded cars are properly sealed and reported to the train clerk, who then checks up the list of cars and furnishes a way-bill for each loaded car, showing the contents, destination, etc. In the case of "foreign" empty cars, a way-, or card-, bill is furnished.

"The conductor of the train also takes a list of the number of all cars in his train, which list is checked with

that of the number-taker, and if they agree, and correspond with the numbers on the way-bills, he receives his way-bills for the cars. In addition, the list made by the number-taker is given to the car record clerk, who records the numbers of the cars, date of leaving, train number, and destination.

"3. *Transfer freight.* As regards transfer freight—or the receiving of freight from, and the delivery of it to, connecting lines—cars are usually classified for the various roads when first switched, and are then made up into "transfer" trains. A record is made of all cars loaded or empty. Duplicate expense bills are made for each car in the transfer train, showing the name of the consignee, destination, contents, weight, charges, car number, and initial. Both of the bills are sent to the road receiving the cars, one copy to be signed and returned by the agent of the receiving road, and the other to be retained by the receiving road for its record. Any car received in a damaged condition, or short as to its billed contents, must be noted on the expense bill returned to the delivering road. This is also true as to seals, which, if defective, must be immediately reported to the delivering road by the receiving agent, giving the car number and initial, date of its arrival, and a statement of the trouble. If the expense bill is returned to the delivering road without any such addition, it is an indication that the shipment has been received in good order; and the transaction, so far as the actual transfer is concerned, is closed.

"Young men seeking employment with railroad companies dislike to take positions in terminal yards, as the pay is small, the hours long, and the work very exacting. Yet no one expecting at some future time to occupy the position of agent of a terminal station can afford to

neglect this work. As agent he would not be able to manage the station so successfully if he did not have the experience to be acquired in the terminal yard. Here is the first round of the ladder, and a person familiar with the small details can handle the general business to better advantage. It is a wide field, and I know of none better suited for a young man making his start in railroading."—F. S. Atkin, Sup't Terminals, C. M. & St. P., in "Railway Organization and Working."

DISTRIBUTION OF CARS.

"The conditions surrounding car distribution are dependent upon the commodities and the geographical location of the railroad. For instance, it is much more difficult to handle car distribution on a road whose particular product is grain or hay, than on a road where the particular commodity is coal or stock; and, again, it is more difficult to handle distribution on a road with a great number of branches or feeder lines, than on a road that has a straight main line.

"The first essential and all-important requisite is that the person in charge of distribution thoroughly familiarize himself with the products originating on his line, and the seasons during which they move. He should also know the destination of such commodities, in order that he may, prior to their movement, gradually accumulate the surplus equipment in the section where it will be needed, and thus avoid hauling the empty cars out of the territory shortly before they will be required for loading. In this manner the empty car mileage, which is one of the large items of operating expenses, is reduced to a minimum.

"The Car Distributor must know at all times where his equipment is located. Such information is furnished him by wire every twenty-four hours, giving the total number of each class of car on hand loaded, empty, held for movement, and in bad order. These data are compiled on each train district by the Chief Dispatcher at a given hour each day, the agent telegraphing the Chief Dispatcher, on a printed form, the number of cars waiting for movement east and the number of cars waiting for movement west, over or less than forty-eight hours; the number of cars held for unloading at his station; the number of empty cars of each class—box, stock, coal, etc.—on hand; the number of cars required for loading, under which item are specified the product awaiting shipment, the destination of the shipment, and, if beyond the home road, the route over which the consignment will be sent, so that the Chief Dispatcher may utilize foreign railroad cars belonging to lines over which the business will move.

* * * * * * *

"For certain commodities, such as lumber, machinery, and ties, shippers frequently order coal- or flat-cars, it being more convenient to load the product into these than into box- or stock-cars. When such orders are placed, showing the commodity, destination, etc., the Chief Dispatcher can, however, often prevail on the shippers to use box- or stock-cars, when it is to the interest of the road to do so. For example, a railroad may have a shipment in southern Illinois for points in Iowa or Minnesota. The shipper calls for coal-cars, which, if loaded into Iowa, where the road has no return traffic for them, must come back empty. On the other hand the road may have some stock- or box-cars moving west

empty, which, if utilized, would save the empty haul into Iowa, and, in addition, would save the empty haul from Iowa back to the southern Illinois mines, if the coal- or flat-cars were used. Again, a shipper may order, for instance, Illinois Central large-capacity box-cars for a shipment of grain, cotton, or any other commodity. If he did not insist upon knowing its destination and route, the Dispatcher might furnish Illinois Central cars for it. The shipment is, however, destined for New York or New England points, to which some eastern foreign cars, then on the division, may be utilized."

"In accordance with the system of car distribution, the shipper must order the cars he requires from the agent at the station where he will load. The agent, at the usual hour each day, will order the cars from his Chief Dispatcher. In case the Chief Dispatcher is unable to furnish all of the cars ordered from his district, he calls upon the Superintendent of Transportation to help him from other divisions or sources. Hence, a shipper cannot order cars direct from the Superintendent of Transportation, or from the Chief Dispatcher, without creating confusion. If the Superintendent of Transportation accepted an order of that kind, and directed the Chief Dispatcher to take care of it, the latter might order the cars to the station direct; but when they reached there the agent would know nothing about the order. He would ask the Chief Dispatcher what the cars were sent for. The Chief Dispatcher, not knowing about the order, would no doubt instruct the agent to bill them and send them on to some other point where he knew they were required. Had the order been transmitted through the proper channel, when the cars reached the station, the agent would know all the facts connected with it, and there would be no hitch in taking care of the shipment.

"The commodities to be moved, and their seasons for shipment, must be carefully watched. The condition of the crops as they mature, and the prospects for marketing them, must likewise be closely studied. On the Illinois Central, for example, we know that fruit and vegetables begin to move in refrigerator-cars from Louisiana points the latter part of March, and keep gradually increasing in volume as the shipping territory expands, until by the middle of June we are loading fruit and vegetables all the way from New Orleans as far north as Centralia, Ill.—a territory of over seven hundred miles. To know what the requirements will be, it is necessary for the Car Distributor to get reports of the condition of the crops as they progress, and of the acreage planted. Frost may kill the tomato or peach crop, in which case he must make his deductions in figuring on the supply of equipment necessary to take care of it, in order to prevent hauling more refrigerator-cars into that section than are actually required for the business; thereby avoiding the return of empty cars, which involves an enormous unnecessary expense.

"There are other factors to consider, in addition to the maturing of the crop. The market price may be extremely low, in which case the grain will not move in such volume as it would if the price were high. The shippers who can afford to store it will naturally do so until the market is favorable. Again, the size of the grain crop is not an indication as to the volume that will move to early market. The crop of the preceding year may have been very poor. In that event a good portion of the present year's crop will be held over for the following year, for feeding and other local consumption, by reason of the supply having been exhausted during the current summer.

"The importance of a uniform system in doing work of this kind, which is more or less complicated, and the advantage of a simple method or system, cannot be too strongly emphasized. Let us take the loading of tomatoes, for example. At * * * * * * * * *, a town of 1,100 people—we are to load a maximum of forty-five carloads of tomatoes in one day. The refrigerator-cars, after having been iced, are placed on long loading-tracks. The men who receive the tomatoes from the farmers divide the cars before any loading is done, by placing flags in the car doors. A white flag indicates that the teams having green, or unripe, tomatoes are to bring them to that car; a red flag denotes that those having ripe tomatoes are to unload them in that car; and a half-red and half-white flag means that the medium-ripe tomatoes are to go in that car. In this way the teamsters have no trouble whatever in lining up for the proper car, the tomatoes having been sorted in the fields before being loaded on the wagons. The object of loading them in this manner is to enable the shipper to route the green product to the most distant point, and the ripe product to the nearest market. If a car was loaded with half-ripe and half-green tomatoes, and shipped to a reasonable distance, the chances are that the ripe tomatoes would age and decay in transit, and long before the green tomatoes were in a marketable condition. I cite this simply to show what good results may be obtained by some plain, simple system. This principle of a uniform system is at the foundation of the successful operation of railroads as well as of other large corporations.

"The distribution of coal-cars is, as a rule, very difficult, the mines, located on branches and spur-tracks, be-

ing badly scattered. The supply of empty coal-cars comes principally from the large manufacturing centers, where the coal is consumed, and in order to afford the mines in the various localities their equal proportions of the cars, it is necessary to keep in close touch with the movement of the empty cars in different directions. It is impossible for the men in charge of large terminals, like Chicago and St. Louis, to notify the Car Distributor at three, four, or five o'clock in the afternoon how many empty coal-cars they will be able to forward between six in the afternoon and six the following morning. The Distributor is, therefore, unable to instruct the Superintendent or the Dispatcher how to divide, between his own and other divisions, the equipment he receives during the night. Consequently the Distributor places an arbitrary distribution order on the percentage basis.

* * * * * * * * *

"It is also the duty of the Car Distributor, Dispatcher, agent, conductor, and all concerned in the distribution and furnishing of cars, to see that large-capacity cars are furnished for shipments that will load to the capacity of the car, and that small, light cars are furnished for the light traffic. For example, it is not good policy to furnish an 80,000 pounds' capacity box-car to handle 6,000 or 7,000 pounds of merchandise, when it is just as easy to furnish a 40,000 pounds' capacity car. Neither is it good practice to furnish two 40,000 pounds' capacity box-cars for shipment of grain, when the shipment could have been loaded into one 80,000 pounds' capacity car. It is more difficult to haul the two than the one, and, in addition, they occupy double track-room in yards, and also entail double the switching expense on terminals.

"The Car Distributor must keep in touch with the repairs to cars, in order that he may get the class of equipment which he requires for immediate use—*i. e.*, box, stock, coal, and refrigerator-cars—given preference on the repair tracks over the class of car which he does not so require. He should also keep informed as to the location of his cars on the tracks of foreign roads, so as to prevent too many of them getting into fields where they will be tied up and delayed. This information is furnished him from the car-record room.

"Each railroad car in existence bears the initials of the road owning it, and an individual number which remains with the car from the day it is built to the day it is destroyed. Railroads exchange information showing the disposition of each other's cars. For example, the Illinois Central loads ten cars at Omaha for Boston. When the ten cars are delivered to the Lake Shore & Michigan Southern at Chicago, the agent of the Illinois Central at this point makes a report to the Car Accountant of his own road, showing the initial and number of each of the ten cars, the date they were delivered to the Lake Shore, their contents, and their destination. When the Lake Shore delivers the ten cars to the New York Central at Buffalo, it mails to the Car Accountant of the Illinois Central—because they are Illinois Central cars—a postal card giving the number of each car and date they were delivered to the New York Central. The New York Central, in turn, furnishes similar information, showing the date the cars were delivered to its connections. In addition to furnishing information showing the present location of the cars, this system also enables the owner to check their per-diem earnings. When the record shows that a connecting line has a great

many more of our cars than we have of theirs, the Car Distributor makes extraordinary efforts to get that connection to furnish us more of their cars, in order to protect loading originating on our line destined to points on theirs. This is especially true during the busy season, where there is a shortage of cars."—J. M. Daly, Ill. Central R. R., in "Railway Organization and Working."

EDITOR'S NOTE: There is probably no more earnest advocate of system in railway working than Mr. John M. Daly, and certainly none better qualified through experience in bringing "order of chaos" by devising systematic plans and demonstrated their practicability. The fuller treatment of this subject by him in the very valuable book referred to is worthy the careful study of all interested in the expeditious movements of freight cars.—THE EDITOR.

LIST OF FREIGHT CARS.

Box	Car.	Common type.
"	"	Furniture and Vehicles.
"	"	Wooden Ware.
"	"	Hearse.
"	"	Ventilated.
"	"	Ice.
"	"	Charcoal.
"	"	Lime.
Refrigerator	"	Common.
"	"	Beer.
"	"	Dressed Beef.
"	"	Dairy Products.
"	"	Ventilated Fruit.
Stock	"	Common.
"	"	Double Decks.
"	"	Single Deck Feed and Water.

Stock	Car	Palace Horse with Stalls.
"	"	" Stock " "
Flat	"	Common.
"	"	Logging.
"	"	Barrel Racks.
"	"	Machinery.
"	"	Gun Trucks.
"	"	Water Tanks.
Gondola	"	Common.
"	"	Hopper Bottom.
"	"	" " Steel.
"	"	Drop Ends.
Ore	"	Iron, etc.
Tank	"	Oil, etc.
Live Poultry	"	
Ballast	"	
"	"	Distributers.

Lidgerwood Rapid Unloaders.

Caboose Cars.

" " Stockmen's Sleepers.

Excavator "

Derrick and Wrecking Cars.

Pile Driver	"
Ditching	"
Side Dump	"
Rotary Snow Plow	"
Flanger	"

Form C. S. 21. (See page 128.)

EXTRACTS FROM THE CODE OF RULES

Governing the Condition of, and Repairs to Freight Cars for the Interchange of Traffic.

ADOPTED BY THE MASTER CAR BUILDERS' ASSOCIATION.

NOTE:—These rules make car owners responsible for, and therefore chargeable with, the repairs to their cars necessitated by ordinary wear and tear in fair service, so that defect cards will not be required for any defects thus arising.

Railroad companies handling cars are responsible for damage done to any car by unfair usage, derailment or accident, and for improper repairs made by them, and they should make proper repairs at their own expense, or issue defect card covering all such damage or improper repairs.

CARE OF FOREIGN FREIGHT CARS.

RULE 1. Each railway company shall give to foreign cars, while on its line, the same care as to oiling, packing and inspection, that it gives to its own cars.

INTERCHANGING FREIGHT CARS.

RULE 2. Cars offered in interchange must be accepted if in safe and serviceable condition, the receiving road to be the judge in cases not provided for in Rules 3 to 56, inclusive.

USE OF DEFECT CARD.

RULE 3. Defect cards shall be 3½ inches by 8 inches, and of the form shown below. They should be printed in red ink on both sides, and shall be filled in on both sides with ink or black indelible pencil. The cards must plainly specify in full each item for which charges are authorized, indicating on which end of the car the defects exist. The end of the car upon which the brake staff is located shall be known as "B" end, and the opposite end shall be known as "A" end. Where there are two brake staffs on same car, the end toward which the cylinder push rod travels shall be known as "B" end.

M. C. B. DEFECT CARD.

(*Name of Road.*)

Car No.....Date.....

Initial .....Line.....

Will be received at any point on this company's line with the following defects:

NOTE.—Fill in defects on both sides with ink or black indelible pencil. Attach this card with four tacks on outside face of intermediate sill, between crosstie timbers.

.....

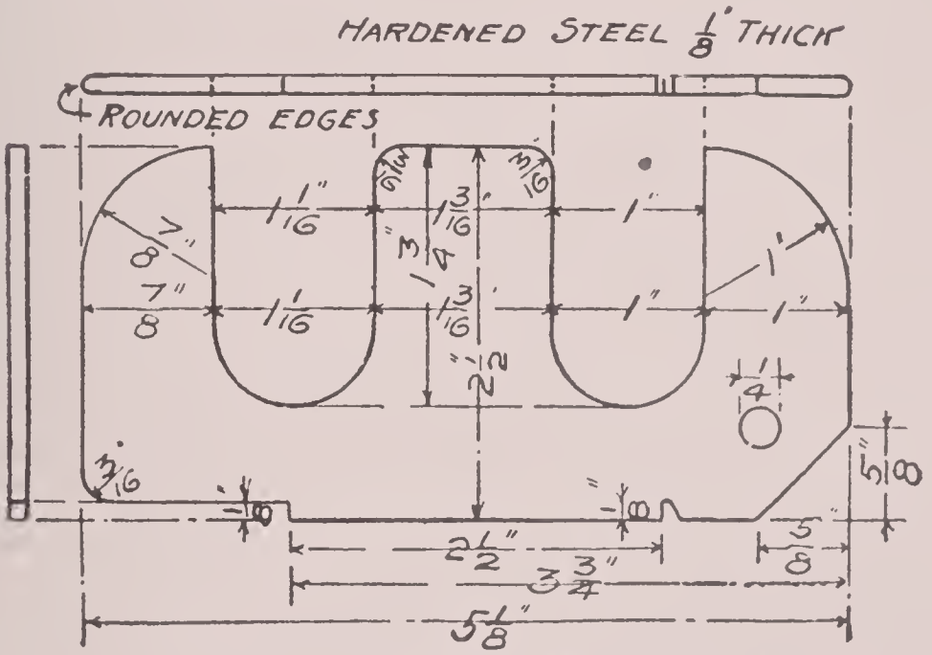
.....

.....

.....Inspector at.....

Send bill on this card to .....

RULE 4. Defect cards shall not be required for defects for which owners are responsible, except for missing material on cars offered in interchange, as provided for in Rules 27 and 41, neither shall they be required of the delivering road for improper repairs that were not made by it, with the exception of the cases provided for in Rules 31, 42, 43 and 44.



Worn Coupler Limit and Wheel Defect Gauge.

Fig. 1.

RULE 5. If a car has defects for which the owners are not responsible, but which do not render it unsafe to run, nor unsafe to trainmen, nor to any lading suitable to the car, the receiving road may require that a defect card be securely attached to the car with four tacks, preferably on the outside face of intermediate sill, between cross-tie timbers, on wooden cars; and on steel cars to cardboard located either on cross-tie under car or on inside of side sill at the end of car.

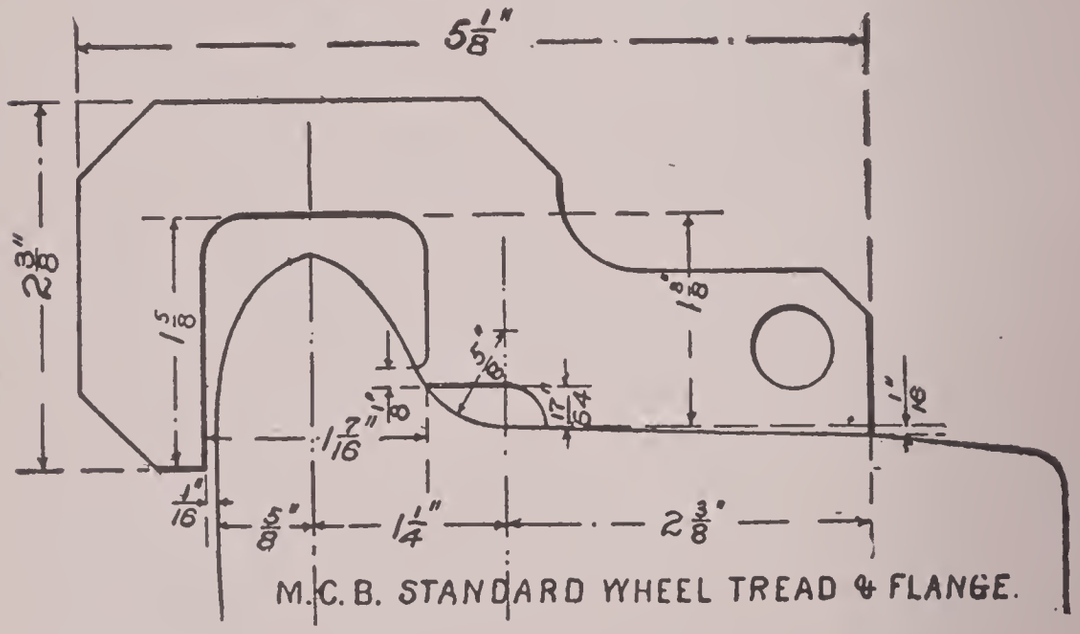
RULE 6. Duplicate defect cards shall be furnished for lost or illegible cards.

WHEELS.

Defects of Wheels Which Justify Renewal.

RULE 7. Shelled out: wheels with defective treads on account of pieces shelling out; if the spots are over 2½ inches, or are so numerous as to endanger the safety of the wheel. (Owners responsible.)

RULE 8. Seams 1 inch long or over at a distance of ½ inch or less from the throat of the flange, or seams 3 or more inches long on any other point of the tread. (Owners responsible.)



Maximum Flange Thickness Gauge.

Fig. 2.

RULE 9. Worn through chill: when the worn spot exceeds 2½ inches in length. Care must be taken to distinguish this defect from flat spots caused by sliding wheels. (Owners responsible.)

RULE 10. Worn flange: cast wheels under cars of less than 80,000 pounds capacity, with flanges having flat vertical surfaces extending more than 1 inch from tread,

or flange 1 inch thick or less. Wheels under cars of 80,000 pounds capacity or over, with flanges having flat vertical surfaces extending more than 7/8 inch from tread. or flange less than 1 1-16 inches thick. (See Figs. 4 and 4*a*.) (Owners responsible.)

Worn flange; steel and steel-tired wheels with flanges having flat vertical surfaces extending more than one inch from tread, or flange one inch thick or less. (See Figs. 4 and 4*a*.) (Owners responsible.)

RULE 11. Thick flange: flange over 1 7-16 inches thick. (See Fig. 2.) (Owners responsible.)

RULE 12. Tread worn hollow: if the tread is worn sufficiently hollow to render the flange or rim liable to breakage. (Owners responsible.)

RULE 13. Burst: if the wheel is cracked from the wheel fit, outward, by pressure from the axle. (Owners responsible.)

RULE 14. Broken flange, caused by seams, worn through chill or worn flange. (See also rules 20 and 21.) (Owners responsible.)

RULE 15. Broken or chipped rim, caused by defective casting, if the tread, measured from the flange at a point 5/8 inch above tread, is less than 3¾ inches in width. (See Fig. 5.) (See also Rules 20 and 21.) (Owners responsible.)

RULE 16. Cracked tread, cracked plate, one or more cracked brackets, or broken in pieces under fair usage. (See also Rule 20.) (Owners responsible.)

Steel or steel-tired wheels loose, broken or cracked hubs, plates, bolts, retaining ring or tire under fair usage. (Owners responsible.)

RULE 17. Wheels loose or out of gauge. (See Fig. 6.) (Owners responsible.)

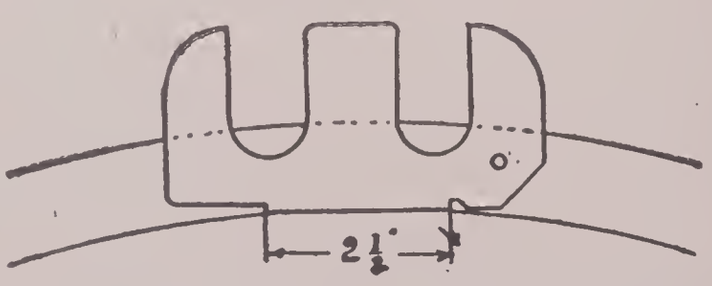
RULE 18. Chipped flange: if chip is on the outside of the flange and exceeds 1½ inches in length and ½ inch in width, or if it extends ⅛ inch past the center of flange. (Owners responsible.)

RULE 19. Flat sliding: if the spot caused by sliding is 2½ inches or over in length. (Care should be taken to distinguish this defect from *worn through chill.*) Delivering Company responsible.)

RULE 20. Broken flange, except as in Rule 14; chipped flange, if chip is on throat side of flange, and exceeds 1½ inches in length and ½ inch in width, or if it extends ⅛ inch past the center of flange; broken rim, if not caused by defective casting, if the tread, measured from the flange at a point ⅝ inch above tread, is less than 3¾ inches in width (see Fig. 5), or any breakage caused by unfair usage, derailment or accident. (Delivering Company responsible.)

RULE 21. The determination of flat spots, worn flanges and chipped treads shall be made by a gauge as shown in Fig. 1. The determination of thick flanges shall be made by a gauge as shown applied to M. C. B. standard wheel tread and flange in Fig. 2.

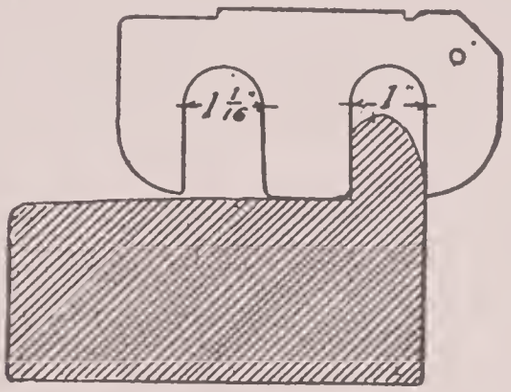
The following engravings of the wheel defect gauge, Fig. 1, show the method of using it:



Method of Gauging Shelled and Flat Spots. See Rules 7 and 19.

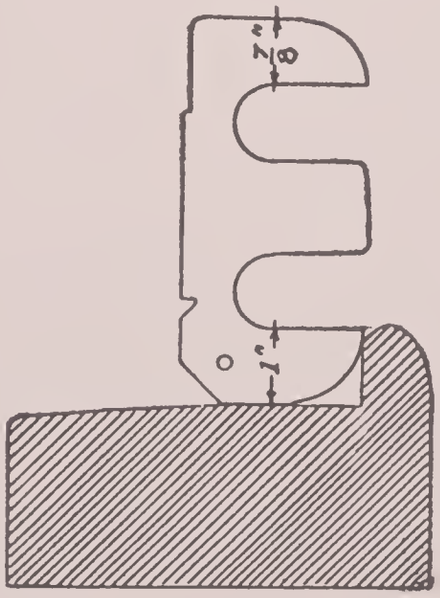
Fig. 3.

For wheels under cars of less than 80,000 pounds capacity, and steel or steel-tired wheels with flanges 1 inch thick or less; 80,000 pounds capacity or over, with flanges less than 1 1-16 inches thick.

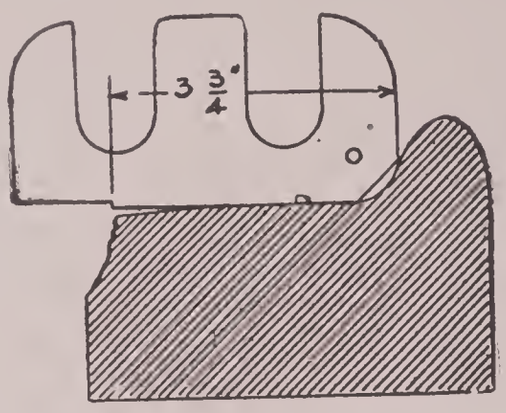


Method of Gauging Worn Flanges. See Rule 10.
Fig. 4.

For wheels under cars of less than 80,000 pounds capacity, and steel or steel-tired wheels 1 inch from tread; 80,000 pounds capacity or over, 7/8 inch from tread.



Method of Gauging Worn Flanges. See Rule 10.
Fig. 4*a*.



Method of Gauging Chipped Rings. See Rules 15 and 20.

Fig. 5.

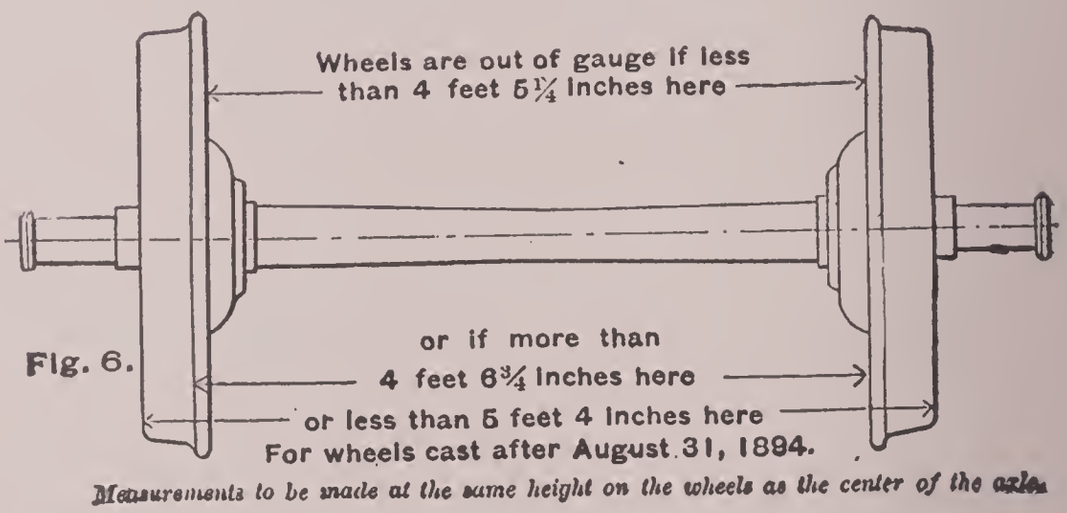

Wheels are out of gauge if less
than 4 feet 5¼ inches here
or if more than
4 feet 6¾ inches here
or less than 5 feet 4 inches here
For wheels cast after August 31, 1894.
Measurements to be made at the same height on the wheels as the center of the axle.

Fig. 6.

AXLES.

Defects of Axles Which Justify Renewal.

RULE 22. Axles broken, or having seamy journals, fillets at the back shoulder worn out, or with collars broken or worn to ¼ inch or less, under fair usage.

RULE 23. Axles less than the following prescribed limits:

For Cars Marked with "Capacity."

Capacity of Car.	Journal.	Wheel Seat.	Center.
100,000	5 inches.	6¾ inches.	5⅞ inches.
80,000	4½ "	6¼ "	5 5-16 "
70,000	4 "	5⅝ "	4⅞ "
60,000	3¾ "	5 "	4⅜ "
50,000	3½ "	4¾ "	4⅛ "
40,000	3¼ "	4⅝ "	3⅞ "
30,000	3 "	4¼ "	3½ "

For Cars Marked "Maximum Weight."

Maximum Weight.	Journal.	Wheel Seat.	Center.
161,000	5 inches.	6¾ inches.	5⅞ inches.
132,000	4½ "	6¼ "	5⅜ "
112,000	4¼ "	6 "	5¼ "
95,000	3¾ "	5½ "	4¾ "
79,000	3½ "	5¼ "	4⅝ "
66,000	3¼ "	4⅞ "	4¼ "
58,000	3 "	4¾ "	4⅛ "

All cars to have their light weight and capacity or their light weight and maximum weight stenciled on them. (Owners responsible.)

RULE 24. Cut journals, axles bent or axles rendered unsafe by unfair usage, derailment or accident. (Delivering Company responsible.)

TRUCKS.

Defects of Trucks Which Justify Repairs if Owners Are Responsible, or Repairs or Carding if Delivering Company Is Responsible.

RULE 25. Defective, missing or worn-out parts of trucks not elsewhere provided for, which have failed under fair usage, or if any part of the truck frame or attachments is less than 2½ inches above the top of the rail. (Owners responsible.)

RULE 26. Damage of any kind to the truck due to unfair usage, derailment or accident. (Delivering Company responsible.)

RULE 27. Material missing from trucks of cars offered in interchange. (Delivering Company responsible.)

RULE 28. Journal bearings and journal box bolts which require renewal by reason of change of wheels or axles for which the delivering company is responsible, regardless of the previous condition of the bearings. (Delivering Company responsible.)

BRAKES.

Defects of Brakes Which Justify Repairs.

RULE 29. Defective, missing or worn-out parts of brakes, not elsewhere provided for, which have failed under fair usage, except missing material on cars offered in interchange. (Owners responsible.)

RULE 30. Cylinder or triple valves of air-brake cars not cleaned and oiled within twelve months and the date of last cleaning and oiling marked on the brake cylinder with white paint. (Owners responsible.)

RULE 31. If 1-inch hose and fittings are found on 1¼-inch train pipe. (Delivering Company responsible.)

RULE 32. Missing or torn air-brake hose or missing or broken air-brake fittings, angle cocks, cut-out cocks cylinders and reservoirs, triple valves, release valves and pressure-retaining valves or parts of any of these items (Delivering Company responsible.)

RULE 33. Damage to any part of the brake apparatus caused by unfair usage, derailment or accident. (Delivering Company responsible.)

RULE 34. If the car has air-signal pipes or air-brake pipes, but no air-brakes, the hose and couplings on the car are at owner's risk, unless the car is stenciled that it is so equipped. (Owner's responsibility qualified.)

RULE 35. Cars equipped with air-brake hose other than M. C. B. Standard hose on and after March 1, 1908. (Owners responsible.)

Except cars offered in interchange, where delivering company is responsible. (Delivering Company responsible.)

RULE 36. On and after September 1, 1907, all cars offered in interchange must be equipped with air-brakes.

BODIES.

Defects of Bodies Which Justify Repairs if Owners Are Responsible, or Repairs or Carding if Delivering Company Is Responsible.

RULE 37. Locks, side doors, end doors, roof doors, grain doors and all inside or concealed parts of cars missing or damaged under fair usage, and failure or loss under fair usage of any part of the body of the car, except

as provided for in Rules 41 and 87. (Owners responsible.)

RULE 38. Cars not within the limits of standard height for couplers, 31½ inches to 34½ inches for standard gauge cars. (Owners responsible.)

RULE 39. Steps, ladders, handholds or running boards in bad order or insecurely fastened, or absence of grabirons or handholds as required by law. Handholds or grabirons must be of wrought iron or steel and secured by bolts or lag screws. (Owners responsible.)

RULE 40. Damage of any kind to the body of the car due to unfair usage, derailment or accident. (Delivering Company responsible.)

RULE 41. Material missing from body of cars offered in interchange, except locks, grain doors and all inside or concealed parts of car. (Delivering Company responsible.)

RULE 42. M. C. B. couplers not equipped with steel or wrought-iron knuckles. (Delivering Company responsible.)

RULE 43. Cars intended to be equipped with metal brake beams and so stenciled, if found with wooden brake beams. (Delivering Company responsible.)

RULE 44. Cars equipped with M. C. B. couplers having pocket rear-end attachments and so stenciled, if found with tail-pin attachments instead of pocket. (Delivering Company responsible.)

RULE 45. Uncoupling attachments of M. C. B. couplers offered in interchange must be made operative before moving from interchange points. (Delivering Company responsible.)

Improper Repairs.

RULE 46. Any company making improper repairs is solely responsible to the owners, with the exception of the cases provided for in Rules 31, 42, 43, 44, 45, and also in case it should be necessary to replace spindle with pocket attachment. (Company making repairs responsible.)

RULE 47. The company making such improper repairs shall place upon the car, at the time and place that the work is done, an M. C. B. defect card, which card shall state the wrong material used. (Company making repairs responsible.)

Combinations of Defects Which Denote Unfair Usage if Caused at One and the Same Time and at the Same End of Car.

RULE 48. Damaged coupler, accompanied by damage to either coupler stop, filling block, draft timber or its substitute, or end sill.

RULE 49. Damaged coupler pocket, accompanied by damage to either draft timber or its substitute, or end sill.

RULE 50. Damaged coupler stop or filling block, accompanied by damage to either coupler or end sill.

RULE 51. Damaged draft timber or its substitute, accompanied by damage to either coupler, coupler pocket, or to end sill.

RULE 52. Vacant.

RULE 53. Damaged end sill, accompanied by damage to either coupler, coupler pocket, coupler stop, filling block, draft timber or its substitute, or longitudinal sill.

RULE 54. Damaged longitudinal sill, accompanied by damage to end sill.

RULE 55. Damaged longitudinal sills, if necessitating replacement or splicing of more than two sills.

RULE 56. Damaged corner and end posts, if necessitating the replacement of, or repairs to, more than two end or two corner posts at one end, or more than one end and one corner post at same end of car.

The word "coupler" in the above rules, 48 to 53, inclusive, means the coupler body or knuckle.

An American continuous draft key shall not enter into a combination of defects denoting unfair usage.

It will be assumed that a missing coupler and attachments are damaged unless shown to the contrary. This only refers to cases where the coupler if broken would enter into the combination of defects.

INSTRUCTIONS TO REPAIR MEN.

RULE 57. Any car having defects which render it unsafe to run, unsafe to trainmen, or to any lading suitable to the car, may be repaired.

RULE 58. Repairs to foreign cars shall be promptly made, and the work shall conform in detail to the original construction, and with the quality of material originally used, except as provided for in Rules 62 and 63. Malleable iron, M. C. B. standards, may be substituted for gray iron, M. C. B. standards, but the net cost to car owner in such cases must be no greater than if the original kind and weight of material had been applied. Gray iron, M. C. B. standards, may be substituted in place of malleable, M. C. B. standards, but in such cases the debits and credits must be for what is actually applied and removed. Repair cards and stubs must state kind of material applied and removed.

RULE 59. In repairing damaged cars M. C. B. standards may be used when of dimensions that do not impair the strength of the cars, in lieu of the parts forming its original construction. When using materials for repairs to foreign cars for which the Master Car Builders' Association has adopted specifications as a standard, the materials must comply with the requirements of these specifications.

RULE 60. In making repairs for which owners are responsible, wheels other than 33-inch may be replaced with 33-inch wheels, if practicable. If changes are necessary in order to bring the car to the proper height, the cost of so doing shall also be chargeable to the car owner.

Fig. 7.

RULE 61. Couplers of the vertical plane type other than M. C. B. replaced with M. C. B. standard, the expense of alteration thus necessitated shall be chargeable to car owners. Couplers that exceed the distance of 5¼ inches between point of knuckle and guard arm measured

perpendicularly to guard arm must be repaired. (See drawing.)

RULE 62. When M. C. B. couplers of another make are placed upon a car, the uncoupling arrangements shall be made operative at the expense of the company making the repairs.

RULE 63. When M. C. B. couplers, knuckles, metal brake beams, wheels or axles are replaced under conditions which make them chargeable to the owner, it must be plainly stated on the repair card and stub whether the material is new or second-hand.

RULE 64. Any company finding cars not within the limits of standard height for couplers may make repairs and charge to owners. Cars should be adjusted in height when empty, as far as possible, and in order to justify a bill for this work under the Rules of Interchange, an empty car measuring 32½ inches or less should be adjusted to 34½ inches, or within ¼ inch thereof, and when it is necessary to alter a loaded car it should be adjusted to 33½ inches, or within ¼ inch thereof, or as nearly as possible to such height as will bring it to 34½ inches, when the car is unloaded, the height to be measured from top of the rails to the center line of the coupler shank.

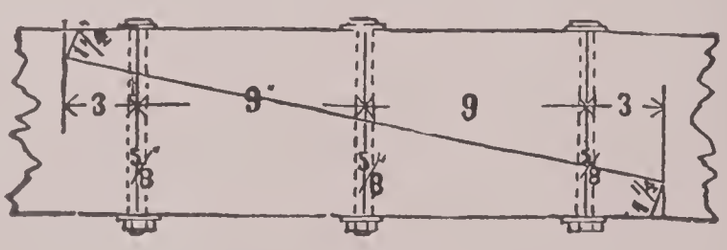


FIG. 8.

RULE 65. Draft timbers must not be spliced. All longitudinal sills may be spliced once. Longitudinal sills, other than center sills, when less than 12 inches in depth,

the plan shown in Fig. 8 is to be followed; when the sills are 12 inches or more in depth the plan shown in Fig. 9 is to be followed; when center sills are spliced the plan shown in Fig. 9*a* is to be followed.

The splice may be located either side of body bolster, but the nearest point of any splice must not be within 12 inches of same, excepting center sills, which must be spliced between body bolster and cross-tie timbers and not within 30 inches of either. The splicing of two adjacent sills at the same end of the car, or the splicing of any sill between cross-tie timbers, will not be allowed.

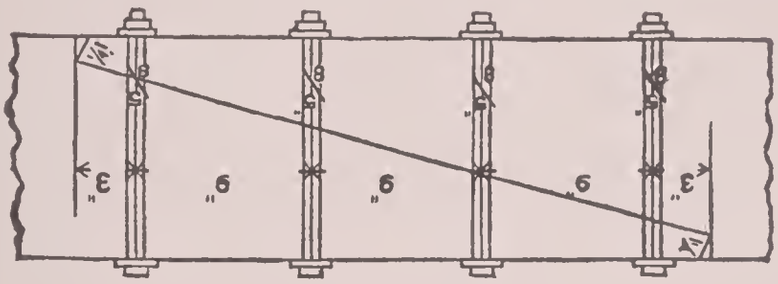


Fig. 9.

Steel sills may be spliced as shown below in Figs. A, B and C.

Rule 66. Wheels on the same axle must be of the same circumference.

Rule 67. New wheels must not be mated with second-hand wheels.

Rule 68. Prick punching or shimming the wheel fit must not be allowed.

Rule 69. The wheel seats of foreign axles must not be reduced more than 1-16 inch to fit the wheels, and in no case must they be reduced below the limits given in Rule 23.

Rule 70. Any company repairing foreign cars with wrong material, and not in compliance with the Rules 57

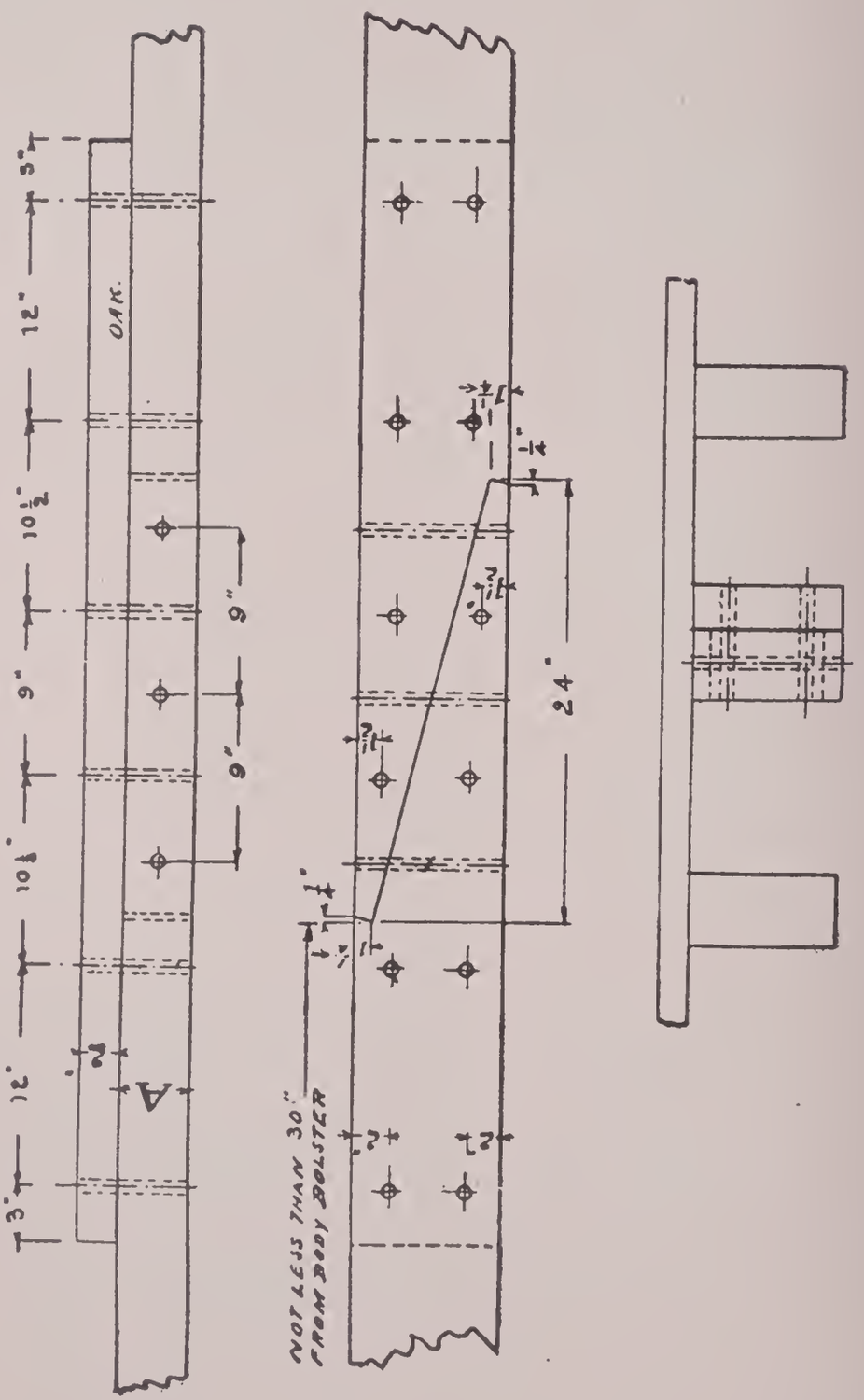


Fig. 9a.

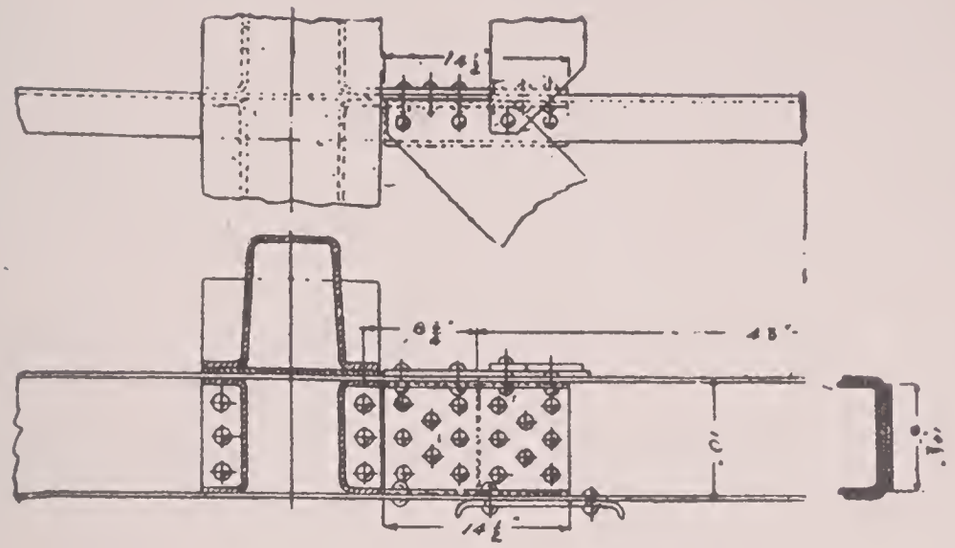


Fig. A.

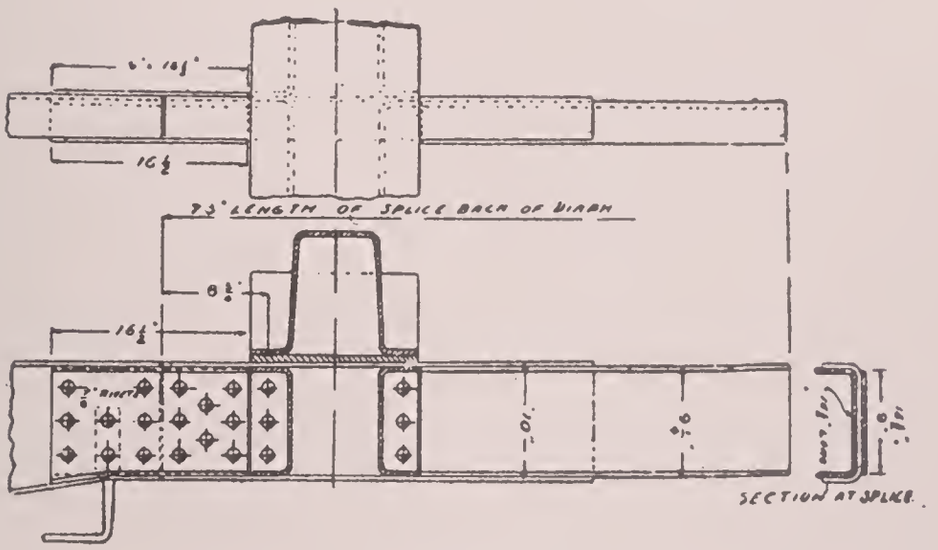


Fig. B.

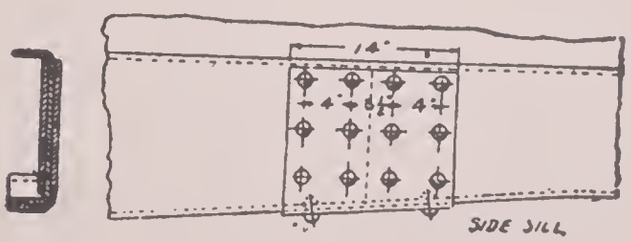


Fig. C.

to 70, inclusive, shall be liable to the owners for the cost of changing such car to the original standard, or to the requirements of these rules, except that companies applying axles smaller than the limits given in Rule 23 shall not be held responsible for improper repairs if the car is not stenciled showing the capacity of the car.

RULE 71. In replacing air-brake hose on foreign cars for which bills are made, new hose must be used.

Air-brake hose applied to foreign cars shall be considered wrong repairs unless they are made in accordance with the M. C. B. specifications and are so labeled.

RULE 72. If the weight of a car is found to vary more than 500 pounds from the light weight stenciled on the car a railroad company having the car in its possession may weigh and restencil the car, making a charge for each car weighed and so reported. The railroad company making the bill shall notify the owner, giving the date and point at which the reweighing was done.

RULE 73. Cars undergoing extraordinary repairs, such as sills, resheathing, roofing, etc., must be reweighed and restenciled by the company having the car in its possession at its own expense, and the owner notified.

RULE 74. When second-hand axles are applied under conditions which make them chargeable to the owners, the diameters of the wheel seats and center must not be less than, and the diameter of the journal must be $\frac{1}{8}$ inch greater than the limiting diameters given in Rule 23. If cars are marked with the word "Capacity," the first set of limits must be followed. If cars are marked "Maximum Weight," the second set of limits must be followed.

RULE 75. When two or more cars chained together, or any cars which require switch chains to handle them,

are delivered at an interchange point, the receiving road shall deliver to the delivering road at the time, an equivalent number of switch chains of the same size as the chains so used on the cars delivered, or, in lieu thereof, furnish a defect card for such chains.

USE OF REPAIR CARD.

RULE 76. When repairs of any kind are made to foreign cars a repair card shall be securely attached to outside face of intermediate sill between cross-tie timbers on wooden cars, and on steel cars to cardboard located either on cross-tie under car or on inside of side sill at the end of car. This card shall specify fully the repairs made, and reason for same, the date and place where made, and name of road making repairs; also show location of parts repaired or renewed. The end of car on which brake staff is located shall be known as "B" end, and the opposite end as "A" end. Where there are two brake staffs on the car, the end toward which the cylinder push rod travels shall be known as "B" end. The card shall be provided with a stub, which will duplicate information on the card and the stubs must be forwarded with the bill.

If no bill is to be rendered, the repair card stub must be forwarded on or before the twentieth day of each month, with the words "no bill" written across the face of the repair card stub. In case it is not the intention to render bill, the words "no bill" shall be written across the face of the repair card.

RULE 77. The repair card shall be 3½ by 8 inches, and the stub 3½ by 4 inches. The card shall be printed on both sides in black ink, and shall be filled in on both sides with ink or black indelible pencil, and be of the following form:

This Stub to be Retained by Person Issuing Card

Master Car Builders' Ass'n Repair Card Stub

C.M.& St.P.Ry. Date_____190

Rep'd at_____Shop

_____Inspector

Car No._____Initials_____

Reasons for repairs noted on other side

When Card is Applied send Stub at once to Supt. Motive Power, West Milwaukee, Wis.

Master Car Builders' Ass'n Repair Card Stub

C.M.& St.P.Ry. Date_____190

Rep'd at_____Shop

_____Inspector

Car No._____Initials_____

(over)

Reasons for repairs noted on other side

Form 617

Master Car Builders' Ass'n Repair Card

Chicago, Milwaukee & St. Paul Ry. Co.

Date_____190—

REPAIRS MADE	WHY MADE

Rep'd at_____Shop_____Inspector

Car No._____ Initials_____

NOTE.—The printing on back of repair card stubs should be the reverse of that shown here.

The cards and stubs must state whether solid or filled journal bearings are applied or removed; also, length of bearing. In the case of couplers applied and removed, they shall state the make and kind of material in couplers and the size of shank. In the case of knuckles, they must state whether open or closed knuckles are removed and applied. In the case of brake shoes removed and applied, they shall state the kind of shoe.

RULE 78. Any road making partial repairs of defects on a car which are covered by defect cards will have the defects repaired crossed off the original card with ink or indelible pencil and card placed back on car. A copy of the card accompanying the bill with the defects which were not repaired crossed off will be sufficient authority to bill.

RULE 79. Duplicate repair cards shall be furnished for lost or illegible cards.

INSTRUCTIONS FOR BILLING.

RULE 80. Bills may be rendered for work done under Rule 57, except in cases where owners are not responsible and the car bears no defect card covering the defects repaired, stating upon the bill the date and place where the repairs were made; the repair card stub or defect card to accompany the bill.

RULE 81. Car owners may require receipt of repair card or stub before payment of bill for repairs.

RULE 82. For repairs made on defect cards, the card must accompany the bill as voucher for the work done, but no bill shall be rendered for repairs which have not been made.

RULE 83. When improper repairs of owner's defects have been made and bill rendered, the owner may counter bill against the company making the wrong repairs for the cost of changing the car to the original standard, or to the requirements of Rules 57 to 79, inclusive, if the work is done.

RULE 84. When improper repairs of defects for which owners are not responsible are made, the owner may make bill against the company making the improper repairs for the cost of changing the car to the original standard, or to the requirements of Rules 57 to 79, inclusive, if the work is done.

RULE 85. The evidence of a joint inspector or the joint evidence of two persons, one representing the owner of the car, and the other representing the delivering road, that the repairs are not proper, shall be final. A joint evidence card shall be used for this purpose, which shall describe and show location of parts repaired or renewed. The end of the car on which the brake staff is located shall be known as "B" end, and the opposite end as "A" end. Where there are two brake staffs on the car, the end toward which the cylinder push rod travels shall be known as "B" end. This card shall be of the following form:

RULE 86. The joint evidence card, accompanied by a proper repair card, upon which a bill has been made, shall be used as authority for rendering bill, but if unaccompanied by such repair card, the joint evidence card shall be sent to the company against which the evidence has been presented, and it shall furnish a defect card covering the wrong repairs if it made them.

RULE 87. Bills may be rendered against car owners for the labor only of replacing couplers, brake beams (in-

THE ..... RAILWAY CO.

REPORT OF IMPROPER REPAIRS TO.....CARS

Station.....190..

Car No.....Initial.....Received from.....Ry. At.....Date.....190..

Description of wrong Repairs.....	How Repairs should be made.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....

Show how Carded on other Side.
We Certify Above to be Correct.

.....Inspector for.....Ry.
.....Inspector for.....Ry.

THE.....RAILWAY CO.

M. C. B. DEFECT CARD. Issued by.....Ry. At.....Date.....190...

Inspector.....Reading as follows.....

.....

.....

.....

.....

.....

M. C. B. REPAIR CARD. Issued by.....Ry. At.....Date.....190...

Inspector.....Reading as follows.....

.....

.....

.....

.....

DISPOSITION OF CAR. Carded to.....Shop; Repaired; went forward without Repairs.

cluding their attachments, such as shoes, heads, key bolts, jaws and hangers), brake levers, top and bottom brake rods that have been lost on the line of the company making the repairs. Coupler springs, followers and yokes may be included in the above, providing they have been lost with the couplers.

RULE 88. In making bills under these rules, the information necessary for the car department should be embodied on the following forms, whether the same is made as a bill or a statement to accompany a bill:

RULE 89. Bills rendered for wheels and axles shall be in accordance with the following schedule of prices for material, with the proper debits and credits:

	New.	Second-Hand.	Scrap.
One 36-in. cast-iron wheel.....	$10.00	$ 7.50	$5.00
One 33-in. cast-iron wheel.....	8.50	6.75	4.50
One axle, 100,000 lbs.....	24.00	13.50	7.75
One axle, 80,000 lbs.....	19.00	11.00	6.50
One axle, 60,000 lbs.....	14.00	7.75	5.25
One axle, 50,000 lbs. (or under)....	12.00	6.50	4.50

and with an additional charge for all labor for each pair of wheels and axles removed from all arch bar trucks of $1.75, and from all solid pedestal trucks of $2.00. If new wheels and axles are substituted for second-hand wheels and axles, proper charges and credits shall be allowed, although such substitution be made on account of only one loose or defective wheel, or a defective axle, with the following exceptions: In case the owner of a car removes a damaged wheel or axle, no charge shall be made for any difference in value between the parts used and those removed that are not damaged.

_____ *Company,*

Address _____

To _____ *Railroad Company, Dr.*

For Wheels and Axles put under _____ *Cars, Month of* _____ *190*

Date and Place	Initial, Kind and No. of Car,	Wheels and Axles Removed.					Wheels or Axles Applied.							
		Maker.	Date Cast	No. on Wheel or Axle	Cause of Removal.	Shop Marks on Wheels and Axles.	Maker.	Date Cast.	No. on Wheel or Axle	New or Second Hand.	Shop Marks on Wheels and Axles.	Material Net Charge.	Labor Charge.	Total Net Charge.

Date _____ *190* *Received payment, $* _____

_____

STATEMENT OF REPAIRS MADE PER M. C. B. RULES TO _____ CARS

BY _____ RAILWAY CO.

DURING _____ 190___

Repairs Made.		CAR.		DESCRIPTION OF PARTS REPAIRED.	Value of Miscellan's Material.	IRON.			BRASS.		Chain.	Lumber.	Spring.		Labor.	CREDIT FOR SCRAP.						
Date.	Place.	Initials.	Number.			Cast.	Wrot.	Mall.	Filled.	Solid.						Cast.	Wrot. & Steel	Mall.	Steel Springs and Chains	Solid Brass.	Filled Brass.
						Lbs	Lbs	Lbs	Lbs	Lbs	Lbs	Ft.	Lbs		Hrs.	Lbs	Lbs	Lbs	Lbs	Lbs	Lbs
				Quantity.											20c.						
				Price.																	
				Value.																	

All steel or steel-tired wheels of the different makes to be charged at current market prices, less freight charges.

Removing, turning and replacing a pair of steel or steel tired wheels; $5.50 for pedestal type of truck and $5.00 for archbar truck.

Loss of service metal from steel or steel-tired wheels for defects for which the delivering company is responsible, to be charged for at the rate of $1.50 per 1-16 inch thickness of tread or tire.

RULE 90. If car owner elects on account of improper repairs to remove M. C. B. standard axles suitable to the capacity of the car, he shall make charge for secondhand axles and allow credit for secondhand axles if they are in good order. Axles removed below the journal limit of 100,000 pounds, 80,000 pounds, 60,000 pounds and 40,000 pounds capacity to be credited as scrap when removed.

RULE 91. Bills for wheel and axle work must make specific mention of each axle and wheel removed or applied.

RULE 92. Bills which do not embody all the information called for by the headings of the columns may be declined until made to conform to the requirements of the rule. If no marks are found on wheels or axles removed, a notation to that effect must be made on face of bill.

RULE 93. In noting on bills the cause of removal of wheels and axles, the terms used in Rules 7 to 24, inclusive, shall be used, and the dimensions of the defect or variations from the prescribed limits should be carefully specified.

RULE 94. Bills for repairs made under these rules and for material furnished shall be in conformity with schedules of prices and credits for the articles enumerated. (See tables in unabridged code.)

RULE 95. Not more than one pound of mineral paint can be charged for 15 square feet of surface covered, and not more than one pound of lead paint for 12 square feet of surface covered. No charge to be made for lettering.

RULE 96. Whenever scrap credits are allowable the weights of scrap credited shall be equal to the weights of the new metal applied, except as otherwise provided in the rules, and except in the case of scrap M. C. B. couplers, and parts of same, and material applied on defect cards, in which cases the weight and kind of metal removed shall be credited.

RULE 97. In the application of channels they should be charged out at the current market price plus the necessary labor for drilling, etc.; credit should be at prices quoted above for similar metal.

RULE 98. Bills shall not be rendered for amounts less than 25 cents in aggregate, but charges for items less than 25 cents may be held until they amount to that sum, provided said aggregate is rendered within 60 days. No bill shall be returned for correction on account of error for less than 100 cents in aggregate of bill, but said bill shall be passed for payment at once, and the alleged error brought to the attention of the road rendering the same within sixty days from date of bill. The receiving road shall at once issue a letter of authority for counter bill to cover the acknowledged error, said letter to be attached to the bill as authority.

No bills shall be returned for correction on account of wrong car numbers, but road rendering bill should be

communicated with by letter, and if, after investigation, it is found to be a fact that wrong car number has been given, correct number shall be furnished or credit covering amount of charge allowed on next month's bill.

When necessary to return bills for correction, all defect cards and repair card stubs should be detached except those covering repairs to cars, the charge for which there may be some question as to its correctness.

RULE 99. All companies rendering bill should consolidate all charges against any one company into one monthly bill.

RULE 100. Journal bearings having a lining 3/8 inch thick or thicker, shall be charged as filled journal bearings, and not as lined journal bearings.

RULE 101. In rendering bills for owner's defects, the following should be observed:

No credit for scrap and no charge for labor shall be allowed in renewing brake shoes.

RULE 102. When M. C. B. coupler parts or metal brake beams are replaced, good secondhand material may be used, but they must be charged at seventy-five per cent of the prices when new. The credits for similar parts released from service in good condition must also be seventy-five per cent of the prices when new.

RULE 103. Manufactured articles not included in the above list must be charged at current market prices, without freight charges.

RULE 104. No percentage to be added to either material or labor.

RULE 105. Bills for the following work, to make cars conform to United States laws and to conform to the requirements of Rule 64, must be rendered within 60

days after the work is done, and must state the height of the car before and after altering:

Altering height of one end of one car, net.....$1.00
Putting on one handhold or grabiron, net..... .25

RULE 106. The table (see unabridged code) shows the number of hours which may be charged for labor in doing the various items of work enumerated, which includes all work necessary to complete each item of repairs, except in so far as labor is already included in charges for materials:

RULE 107. No charge to be made for labor of replacing or applying M. C. B. knuckles, knuckle pins, locking pins, clevises, clevis pins, lift chains, brake shoes or brake-shoe keys, except on the authority of a defect card.

RULE 108. When it is necessary to apply an M. C. B. coupler complete, on account of a broken or missing knuckle, the usual labor charge for replacing a coupler can be made.

RULE 109. No additional labor to be charged for applying center pins or friction rollers or for putting car on center when center-plate bolts or center plates are renewed on same end of car.

RULE 110. No additional labor to be charged for renewing dead block or platform plank if end sill at same end is renewed or replaced.

RULE 111. No additional labor to be charged for replacing or renewing coupler when one or both draft timbers are replaced or renewed at the same end of car at the same time.

RULE 112. The table (see unabridged code) shows the labor charges allowable in cents for the items named in air-brake work: The letters "R. & R." mean "removed and replaced."

RULE 113. The settlement prices of new eight-wheel cars shall be as shown (see unabridged code), with an addition of $27.50 for each car equipped with air brakes. The road destroying a car with air brakes may elect to return the air-brake apparatus, including such attachments as are usually furnished by the air-brake manufacturer, complete and in good condition.

RULE 114. In the case of wooden cars, the depreciation due to age shall be estimated at 6 per cent per annum upon the yearly depreciated value of the bodies and trucks only. In the case of all steel cars and cars with steel underframes, the depreciation shall be 5 per cent per annum for the bodies of all steel cars; for bodies of cars with steel underframes the depreciation shall be at the rate of 6 per cent per annum with the exception of flat cars with wooden floors, which shall be 5 per cent per annum. The depreciation on the value of trucks of steel cars shall be 6 per cent per annum. Allowances for depreciation shall in no case exceed 60 per cent of the value new. The amount $27.50 for air brakes shall not be subject to any depreciation.

RULE 115. The bodies of refrigerator cars, special stock cars, tank cars, except the tanks, and other freight cars, designed for special purposes, not referred to above, shall be settled for at the present cost price, as may be agreed to by the parties in interest, less the deduction for depreciation due to age, which shall be on the same basis as for regular freight equipment.

RULE 116. In rendering bills, cars shall be treated as belonging to companies or individuals whose name or initials they bear, except in case of Line Cars where the equipment list of the general officers of the Line designates a party to make settlement.

RULE 117. Switching roads will only be allowed to render bills against car owners for the following defects repaired by them: Roof lost on account of decay or faulty construction, worn-out brasses, broken truck springs, truck transoms, arch bars, draft-timber bolts, column bolts, truck hangers, truck transom truss rods, truck bolsters, truck bolster truss rods, oil boxes, spring planks, truck hanger pins, side bearings and center plates, center-plate bolts, center pins, followers, American continuous rods or keys, draft springs, couplers, knuckles and drawbar pockets and rivets, defective wheels as specified in Rules 7 to 18, inclusive, defective axles as described in Rules 22 and 23, cars not within the limits of standard height for couplers, as per Rule 38, safety appliances as prescribed by Rule 39, and grain doors and all inside or concealed parts of bodies of cars missing or damaged under fair usage as prescribed in Rule 37, provided the damage has not been caused by derailment or rough usage. They will be allowed to render bills direct against car owners on all car owners' defects on cars received by them from a railroad company, provided they procure joint evidence from the delivering road that such car owners' defect existed when the car was delivered by the railroad company, joint evidence to accompany the bill against the car owner.

RULE 118. A switching road is a corporation doing the major part of its business on a switching charge.

RULE 119. Bills may be rendered against car owners for the cost of applying temporary running boards and hand rails to make cars safe for trainmen.

DESTROYED CARS AND THE RETURN OF TRUCKS.

RULE 120. The company on whose line the bodies or trucks are destroyed shall report the fact to the owner

immediately after their destruction, and shall have its option whether to rebuild or settle for the same.

RULE 121. If the company on whose lines the car is destroyed elects to rebuild either body or trucks, or both, the original plan of construction must be followed, and the original kind and qualities of materials used. The rebuilding must be completed within 60 days from the original date of damage or destruction. In such cases no allowance shall be made for betterments.

RULE 122. If only the body of a car is destroyed, and the company destroying it elects to return the trucks, they shall be put in good order, or accompanied by a defect card, covering all defects or improper repairs made by them for which owners are not responsible, and forwarded, within 60 days, free of freight or other charges, to the nearest point on the line of the company owning or operating the car, and the number, line and class of car destroyed shall be stenciled or painted on each truck so returned.

RULE 123. The company on whose line the body or trucks of a car are seriously damaged, but not destroyed, may notify the owner and ask an appraisement on the damage done to the car as a basis for the disposal of the damaged car.

RULE 124. For the mutual advantage of railway companies interested, the settlement for a car owned or controlled by a railway company, when damaged or destroyed upon a private track, shall be assumed by the railway company delivering the car upon such tracks.

SENDING HOME WORN-OUT AND DAMAGED CARS.

RULE 125. A car unsafe to load on account of general worn-out condition, due to age or decay, shall be reported

to its owner, who must be advised of all existing defects. If the owner elects to have it sent home, he shall furnish two home cards, noting upon them existing defects and the route over which the car is to be returned to its owner. If the route coincides with that over which the car passed to the point where it became unserviceable, no liability shall be incurred as between the owner and the road handling the car, either for freight charges in handling the car or for car service during this movement.

Such cards shall be attached to each side of the body of the car. They shall be 3½ by 8 inches, and of the form shown below. They shall be printed on both sides, and shall be filled in on both sides with ink or black indelible pencil:

FROM

.....R. R.

TO

.....R. R.

VIA

.....

.....

Car No. .....Initials.....

To be shopped for.....

.....

.....

.....

(Head of Car Department.)

RULE 126. A car which is safe to run, but unsafe to load on account of serious damage caused by wreck or accident, shall be reported to the owners for appraisement and disposition, and disposed of as provided in Rule 125, if the owner so elects.

RULE 127. In case of cars of private ownership sent home an account of general worn-out condition due to age or decay, such cars shall be entitled to as many miles of homeward movement, free of charge to owners, as they may have been handled over said line under load, and to mileage to be paid to owners by roads handling. If the haul necessary to get cars home is in excess of such loaded mileage, said excess will be billed against the owner at regular freight rates and the owner notified.

RULE 128. Private line cars sent home to owners on account of being wrecked or damaged in accident shall be regularly billed home free of charge to owners and owners notified, providing such homeward movement passes over roads which have handled the cars loaded, previous to their homeward empty movement; otherwise the damaged cars to travel home empty, free of charges and free of mileage according to home route; or, if owners prefer to have them billed home via direct line, then charges to accrue to such line over which cars were not entitled to free movement.

FURNISHING MATERIALS.

RULE 129. Companies shall promptly furnish to each other, upon requisition, and forward free over their own road, material for repairs of their cars injured upon foreign lines that can not be procured in open market. Requisition for such material shall state that it is for

repairs of cars, and shall give the number and lettering of such cars and pattern number of castings required when possible.

CONDITIONS OF ACCEPTANCE OF THIS CODE.

RULE 130. Any car owner or railway company may become a party to this Code of Rules by giving notice through one of its general officers to the Secretary of the Master Car Builders' Association.

Railroad companies becoming subscribers to this Code of Rules must have a representative member in the Master Car Builders' Association.

RULE 131. Any car owner or railway company that is a party to this Code of Rules shall be bound by same through its successive revisions, until one of its general officers files with the Secretary of the Master Car Builders' Association its notification of withdrawal.

RULE 132. Acceptance or rejection of this Code of Rules must be as a whole, and no exception to an individual rule or rules shall be valid.

SETTLEMENT OF DISPUTES.

RULE 133. In order to settle disputes arising under the rules, and to facilitate the revision of the rules at the annual conventions of the Association, an Arbitration Committee of five representative members shall be appointed annually by the Executive Committee; three members of this committee to constitute a quorum.

In case of any dispute or question arising under the rules between the subscribers to said rules, the same may be submitted to this committee through the secretary,

in abstract, jointly, said abstract setting forth the point or points at issue, and each party's interpretation of the rules upon which its claim is based, clearly and concisely, not exceeding three typewritten pages of letter size, single space, which shall be signed by both parties to the dispute. Should one of the parties refuse or fail to furnish the necessary information, the committee shall use its judgment as to whether, with the information furnished, it can properly give its opinion. The decisions of the committee shall be final and binding upon the parties concerned. This committee shall report its decisions to the Association, and its report shall be incorporated in the annual report of proceedings of the Association.

CODE OF RULES

GOVERNING THE CONDITION OF, AND REPAIRS TO, PASSENGER EQUIPMENT CARS IN INTERCHANGE.

1. Each Railway shall give to foreign cars, while on its line, *the same care and attention that it gives its own cars,* except in case of cars on which work is done under special agreement existing between the company owning the cars and the Road operating the same.

2. The expenses of maintenance of Passenger Equipment operated in interchange or line service, shall be divided into three classes, namely:

(a) Owner's defects.

(b) Delivering Company's defects.

(c) Line expenses proratable against the roads comprising the lines on a mileage basis.

3. (a) Owner's defects are those due to ordinary wear and tear.

(b) Delivering company's defects are those due to unfair usage, derailment or accident. Delivering company is solely responsible to car owners for any improper repairs made by them.

(c) Line expenses shall consist of the expense of terminal cleaning, lubrication (oil, waste, tallow and labor), lighting (oil, wicks, chimneys, burners, shades, gas, candles and broken glass).

4. The railway making the repairs for the defects not proratable against the line is privileged to bill the car owner for these repairs, unless there is evidence to indicate that the damage was occasioned by unfair handling on the part of the delivering company.

5. Information as to mileage made by cars must be furnished promptly on request of owners by railways over which cars are run.

6. (a) Cars shall be thoroughly oiled at terminals.

(b) No charge to be made for lubrication at intermediate points.

7. Only one journal bearing per journal may be charged per trip.

8. No labor charge shall be made for applying brake shoes, journal bearings, hose (air, steam or signal) or for icing, filling lamps, gassing tanks or coaling cars.

9. No credit to be allowed for scrap brake shoes removed.

NOTE—Steel back brake shoes not to be removed if over one-half (½) inch thick; grey iron shoes not to be removed if over three-quarter (¾) inch thick.

10. Loss of metal from tires of steel-tired wheels, caused by flat sliding, is chargeable to the company on whose road the damage is inflicted.

NOTE—Loss of service metal from steel-tired wheels as a result of sliding to be measured from point where slide begins. One-sixteenth (1-16) inch of metal to be allowed for flat spots under two and one-half (2½) inches long and one-eighth (⅛) inch of metal to be allowed for flat spots two and one-half (2½) to three and one-half (3½) inches in length, both inclusive.

11. (a) Axles broken under fair usage or having journals one-half (½) inch or more under the standard for car (except for three and three-quarters by seven (3¾ by 7) which will be condemned at three and one-half (3½) inches) may be renewed at the expense of the car owner.

(b) Cut journals, axles bent or broken or rendered unsafe by unfair usage, derailment or accident, shall be renewed at the expense of the railway on whose line damage is inflicted.

(c) Where necessary to true up axles in cases of cut journals, where the journal is reduced below the limit as prescribed in Rule 11-a, axle must be changed at the expense of company cutting journal.

Charge for car heating to be 10 cents per day per car.

12. Cars lying at stations for over forty-eight hours, expense of heating to be borne by railway in whose possession cars may be.

13. (a) Brakes must be in perfect working order. Cylinders and triple valves must have been cleaned and oiled within six (6) months, and in case of cars equipped with high speed brakes, triple and high-speed valves must be cleaned every three (3) months and date of last cleaning and oiling stenciled on brake cylinder and triple valve with white paint.

(b) The adjustment of piston travel based on not less than seventy (70) pounds initial pressure must not be less than five (5) inches nor more than eight (8) inches.

DEFECTS IN WHEELS—OWNERS RESPONSIBLE.

14. (a) Loose wheels.

(b) Variation from gauge if less than 4 feet 5¼ inches inside of wheel at flange, or, if more than 4 feet 6¾ inches outside of flange or less than 5 feet 4 inches outside of tread.

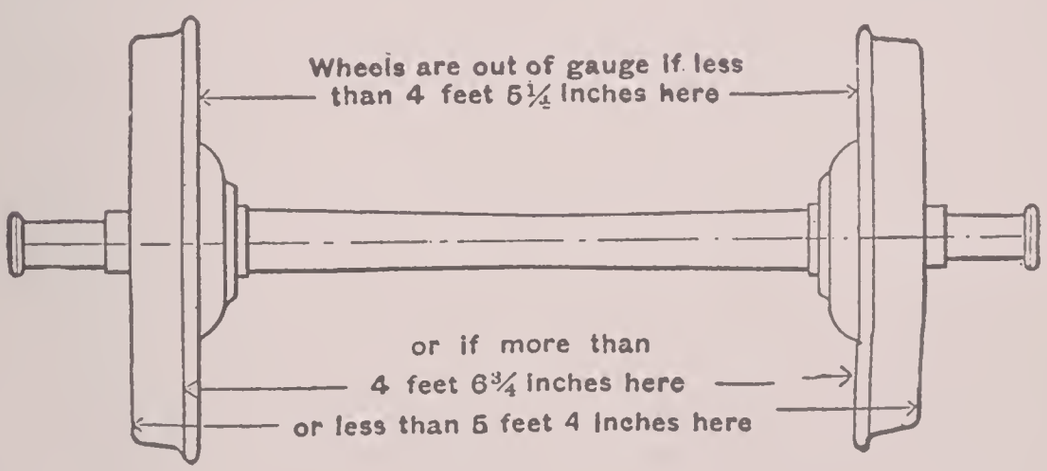

Wheels are out of gauge if less than 4 feet 5¼ inches here
or if more than 4 feet 6¾ inches here
or less than 5 feet 4 inches here

Fig. 10.

WHEELS—CAST-IRON.

15. (a) Shelled out: wheels with defective treads on account of pieces shelling out; if the spots are over one (1) inch or so numerous as to endanger the safety of the wheel.

(b) Tread worn hollow; if tread is worn hollow ⅛ inch or over.

(c) Worn flanges; flanges having flat vertical surfaces extending more than ¾ inch from tread, or, flanges less than 1⅛ inches thick.

(d) Burst; if wheel is cracked from wheel fit outward by pressure from axle.

(e) Flange, rim, tread, plate brackets or any other part of wheel, either cracked, chipped or broken under fair usage.

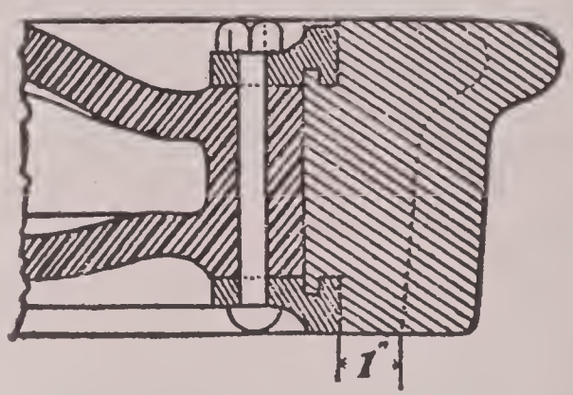


Fig. 11

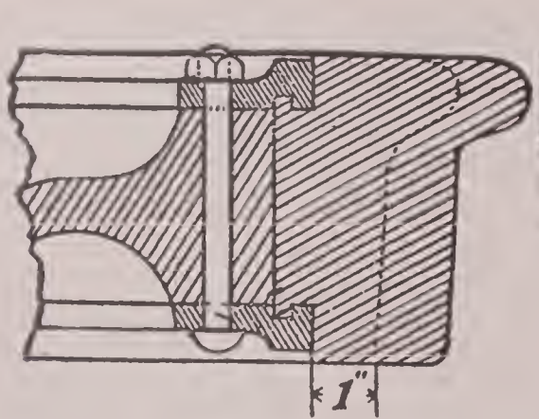


Fig. 12.

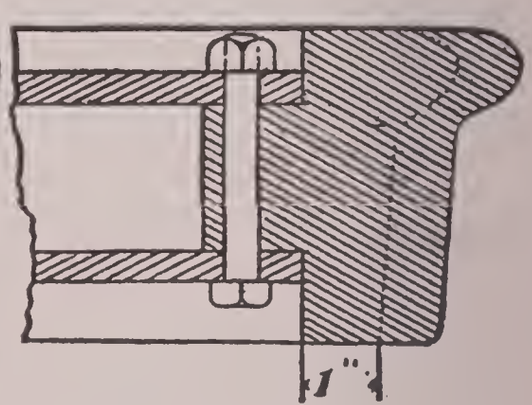


Fig. 13.

WHEELS—STEEL-TIRED.

16. (a) Loose, broken or cracked hubs, plates, bolts, retaining ring or tire, occurring under fair usage.

(b) Worn flange or tire; with flange less than 1 inch thick or having flat vertical spot extending more than ¾ inch from tread, or with tire thinner than shown in Figs. 11, 12, 13 and 14.

DELIVERING COMPANY RESPONSIBLE.

17. Flat spots; if flats spots, caused by sliding, exceed one inch in length.

18. (a) If a car is transferred from the service of one railroad to that of another, the receiving road shall issue gas certificate authorizing the delivering road to bill against it for the number of atmospheres of gas and number of holders at the time car was received.

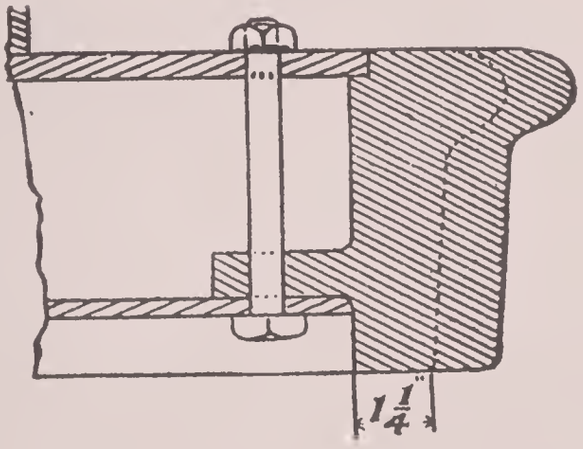


Fig. 14.

(Name of Road.)
GAS CERTIFICATE.

....
Car Number..... Initial.....
Number of Atmospheres.....
Number of Holders.....
Size of Holders.....
.....Station, ...190..
.....Inspector.

(b) Cars in interchange requiring holders to be filled, the receiving road shall be charged for the quantity of gas supplied.

(c) For cars stored in shops for repairs the company having car in its possession shall be responsible to the delivering company for the gas in holders. This will apply to sleeping-car companies when cars are in their possession and out of service.

19. The depreciation of all passenger equipment cars due to age shall be 3 per cent per annum, to continue not to exceed 50 per cent of the original value of car body. The depreciation of trucks shall be 3 per cent per annum, to continue not to exceed 50 per cent of the original value. No depreciation shall be allowed on the value of air brakes.

20. This code of rules is understood to apply to all equipment interchanged in passenger trains.

21. Bills for line charges shall be made and rendered monthly and prices for materials and labor shall be in accordance with accompanying schedule.

CATECHISM

OF THE RULES GOVERNING CONDITION AND REPAIRS OF FREIGHT CARS FOR THE INTERCHANGE OF TRAFFIC.

Q. 1. What are the Master Car Builders' Rules?

A. A code of rules governing the condition of and repairs to freight cars for the interchange of traffic.

Q. 2. What is the object of the M. C. B. Rules?

A. To facilitate the interchange of freight cars, establish responsibility for defects, and uniformity of practice in inspecting and repairing cars in service and in rendering bills for repairs made.

Q. 3. What is the underlying idea or principle of these rules?

A. To make owners of cars responsible for and chargeable with certain repairs to their cars.

Q. 4. Under what conditions do they make the owners responsible for the cost of repairs to their cars?

A. When repairs are rendered necessary by ordinary wear and tear in fair service.

Q. 5. Has this not always been the rule of the M. C. B. code?

A. No, not to the same extent as at present. Prior to September 1, 1896, car owners were not responsible for ordinary wear and tear of all parts of cars, especially bodies, and this led to vexatious delays and numerous disputes as to responsibility.

Q. 6. What has been accomplished by the extension of the principle referred to?

A. The delivering line (road handling the car) is not now held responsible for defects arising from ordinary wear and tear in handling cars, with the exception of missing material on cars offered in interchange.

Q. 7. When is a company, operating the cars of another company responsible for defects of such cars?

A. When the defects are due to unfair usage, derailment or accident, and further for improper repairs made by it to such cars, and for missing material on cars offered in interchange.

Q. 8. When a company is thus responsible what should it do?

A. It should either make proper repairs at its own expense or issue a defect card covering the defects or improper repairs.

Q. 9. To what does Rule 1 of the M. C. B. code relate?

A. To the care of foreign cars.

Q. 10. What is meant by a foreign car?

A. Any car handled by a railroad in its trains which does not belong to that railroad but to another company or individual.

Q. 11. What care should be given to foreign cars by the company hauling them?

A. The same care in oiling, packing and inspecting that it gives to its own cars.

Q. 12. To what does Rule 2 of the M. C. B. code relate?

A. To the interchanging of freight cars.

Q. 13. What is meant by interchanging cars?

A. Passing them in service from one road to another.

Q. 14. What cars must be accepted in interchange?

A. All cars that are in a safe and serviceable condition.

Q. 15. Who is the judge as to the safe and serviceable condition of cars offered in interchange?

A. The receiving road in all cases not specifically provided for in Rules 3 to 56.

Q. 16. To what do Rules 3 to 56 of the M. C. B. code relate?

A. To instructions for inspectors, and they are of the greatest importance.

Q. 17. To what subjects do these Rules principally relate?

A. To the use of defect cards, to defects of wheels, axles, trucks, brakes and car bodies, and to improper repairs and definitions of unfair usage.

Q. 18. What is a defect card?

A. A card describing certain defects existing in a car at the time of its receipt in interchange. It is 3½ inches by 8 inches, and is printed on both sides in red ink to distinguish it from Repair Cards which are printed in black.

Q. 19. What is printed on the defect card?

A. A standard form of words giving information which identifies the date, the car and the owner and the existing defects and the inspector who issues the card.

Q. 20. Who fills out the defect card?

A. The inspector of the delivering road.

Q. 21. How does he fill it out?

A. By writing in ink or black indelible pencil, on both sides of the card, the number and initials of the car, date, and full description of each item for which charges are authorized, indicating on which end of the car the defects exist. The end of the car upon which the brake

staff is located shall be known as "B" end, and the opposite end shall be known as "A" end. Where there are two brake staffs on same car, the end toward which the cylinder push rod travels shall be known as "B" end.

Q. 22. What is done with the card after it is filled out?

A. It is fastened with four tacks on the outside face of the intermediate sill, between cross-tie timbers on wooden cars and on steel cars to cardboard located either on cross-tie under car or on inside of side sill at the end of car.

Q. 23. Under what conditions would you, as delivering inspector, issue a defect card?

A. When the company which I represent is responsible for the defects for which the card is requested by the receiving inspector.

Q. 24. Under what conditions would you refuse to issue a defect card?

A. If the owner of the car is responsible, under the M. C. B. rules, for the defects.

Q. 25. Is there no exception to this?

A. Yes; missing material is excepted, as provided for in Rules 27 and 41.

Q. 26. Are these the only exceptions?

A. No. Rules 31, 40, 42 and 43 specify other exceptions relating to improper repairs of air brake hose and fittings and M. C. B. couplers.

Q. 27. Under what conditions, then, are you obliged to accept a car which has defects for which the owner is not responsible?

A. I am obliged to accept the car so long as its defects do not render it unsafe to run, unsafe to trainmen

or to any suitable lading, but I can demand that a card describing the defects be securely attached to the car.

Q. 28. What is done in case a defect card is lost or is illegible?

A. A duplicate must be furnished by the road which issued the original card.

Q. 29. What else is treated of in the instructions for Inspectors?

A. Rules 7 to 20 refer to defects of wheels which justify removal. It divides these defects into two classes.

Q. 30. What are the two classes?

A. Defects for which the owner is responsible, and defects for which the delivering company is responsible.

Q. 31. What are the defects of wheels for which owners are responsible?

A. Shelled out[1], Seams[2], Worn through chill[3], Worn flange[4], Thick flange[5], Hollow tread[6], Burst wheel[7], Broken flange[8], Broken or chipped rim[9], Cracked tread[10], Cracked plate[10], Cracked brackets[10], Broken in pieces (under fair usage)[10], and Loose wheels[11] or Wheels out of gauge[11], and Chipped flange[12].

(See following notes.)

1. Shelled out; wheels with defective treads on account of pieces shelling out, if the spots are over 2½ inches, or are so numerous as to make the wheel unsafe.

2. Seams, one inch long or over at a distance of ½ inch or less from the throat of the flange, or seams three or more inches on any other point of the tread.

3. Worn through chill; when the worn spot exceeds 2½ inches in length. Care must be taken to distinguish the defect from flat spots caused by sliding wheels.

4. Worn flange; wheels under cars less than 80,000 pounds capacity, with flanges having flat vertical surfaces extending more than 1 inch from tread, or flange 1 inch thick or less. Wheels under cars of 80,000 pounds capacity or over with flanges having

flat vertical surfaces extending more than 7/8 inch from tread, or flange less than 1 1-16 inches thick. (See Figs. 4 and 4a.)

Worn flange; steel and steel-tired wheels with flanges having flat vertical surfaces extending more than one inch from tread, or flange one inch thick or less. (See Figs. 4 and 4a.)

5. Thick flange; flanges over 1 7-16 inches thick. See Figure 2.

6. Tread worn hollow; if the tread is worn sufficiently hollow to render the flange or rim liable to breakage.

7. Burst; if the wheel is cracked from the wheel fit outward, by pressure from the axle.

8. Broken flange; caused by seams, worn through chill, or worn flange. Compare Rule 20, Question 32.

9. Broken or chipped rim; caused by defective casting, if the tread, measured from the flange at a point 5/8 inch above tread, is less than 3¾ inches in width. Compare Rule 20, also see Fig. 5.

10. Cracked tread; cracked plate, one or more cracked brackets, or broken in pieces under fair usage. Compare Rule 20, Question 32.

Steel or steel-tired wheels loose, broken or cracked hubs, plates, bolts, retaining ring or tire under fair usage.

11. Wheels loose or out of gauge. Compare Figure 6.

12. Chipped flange; if the chip is on the outside of the flange and is more than 1½ inches long and ½ inch wide, or if it extends 1/8 inch past the center of flange.

Q. 32. For what defects is the delivering company responsible?

A. For flat spots caused by sliding, if 2½ inches or more in length, and all defects caused by unfair usage, derailment or accident, also a number of cases named in Rule 20, which reads: Broken flange except as in Rule 14; chipped flange, if chip is on throat side of flange and exceeds 1½ inches in length and ½ inch in width, or if it extends 1/8 inch past the center of flange; broken rim, if not caused by defective casting; if the tread measured from the flange at a point 5/8 inch above tread is less than 3¾ inches in width (see Fig. 5), or any breakage caused by unfair usage, derailment or accident."

Q. 33. What is the definition of each of the various defects you named before, and where can it be found?

A. Rules 7 to 20 define these defects in the order named and give measurements for determining many of them.

Q. 34. How can you obtain these measurements accurately?

A. By the use of the M. C. B. wheel defect gauge.

Q. 35. Where is description of the gauge to be found?

A. In the Master Car Builders' Rules governing repairs. The wheel defect gauge is shown (Fig. 1), and the flange thickness gauge (Fig. 2), several different applications of the wheel defect gauge are shown. (Figs. 3, 4, 4a and 5.) (See foregoing rules.) The last four cuts illustrate the application of this gauge for determining flat and shelled spots, worn flanges and chipped rims, and make the method of using it perfectly clear.

This gauge also embodies the worn coupler limit dimensions.

Q. 36. How is the proper distance apart of wheels on the axle determined?

A. The diagram in M. C. B. rules shows the proper method of gauging. (See Fig. 6.)

Q. 37. What is the next subject after "Wheels?"

A. Defects of axles which justify renewal. Rules 22 and 23 treat of axle defects for which owners are responsible, and Rule 24 of defects for which the delivering company is responsible.

Q. 38. For what defects in axles are owners responsible?

A. For axles broken or having seamy journals, fillets at the back shoulder worn out, or with collars broken or

worn to ¼-inch or less under fair usage, or axles worn to less than the M. C. B. prescribed limits.

Q. 39. Upon what are these M. C. B. limits based, and what are they?

A. They are based upon the capacity of the car upon the principle that the heavier the load to be carried the larger must be the axle to carry it. The prescribed dimensions are given under Rule 23 of the M. C. B. rules.

Q. 40. What parts of the axle are limited or prescribed by the M. C. B. rules?

A. The center, the wheel seat, and the journal.

Q. 41. How can we tell whether a car is too heavy for its axle or not?

A. All cars interchanged are required to have their light weight and capacity or their light weight and maximum weight stenciled on them and the table of axle dimensions for each capacity or maximum weight of car is given in Rule 23.

Q. 42. For what defects in axles are delivering roads responsible?

A. For cut journals, axles bent or axles rendered unsafe by unfair usage, derailment or accident.

Q. 43. What is the fourth subject treated of under "Instructions for Inspectors."

A. Rules 25 to 28 relate to defects of trucks which justify repairs if owners are responsible, or repairs or carding if delivering company is responsible.

Q. 44. For what defects in trucks are owners responsible?

A. Defective, missing or worn out parts of trucks not elsewhere provided for, which have failed, under fair usage, or if any part of the truck frame or attachments is less than 2½ inches above top of rail,

Q. 45. For what defects in trucks is the delivering road responsible?

A. For all missing material, for journal bearings which require renewal by reason of change of wheels or axles, for which the delivering company is responsible, regardless of the previous condition of the bearings, and for damages of any kind due to unfair usage, derailment or accident.

Q. 46. What is the fifth subject treated of in these "Instructions?"

A. Brake defects which justify repairs.

Q. 47. For what brake defects are owners responsible?

A. Defective, missing and worn-out parts of brakes not elsewhere provided for, which have failed under fair usage except missing material on cars offered in interchange* and cylinders and triple valves when they have not been cleaned and oiled within twelve months.

Q. 48. How can you tell whether the cylinder and triple valve have been oiled within twelve months?

A. The rules require that the date shall be marked with white paint on the cylinder when they are cleaned and oiled.

Q. 49. What parts of the air brake do the rules declare cannot be missing under fair usage?

A. Missing or torn air-brake hose or missing or broken air-brake fittings, angle cocks, cut-out cocks, cylinders and reservoirs, triple valves, release valves and pressure-retaining valves or parts of any of these items, thus placing the responsibility for these on the delivering roads.

*The idea being to punish the delivering road for not having made proper repairs and charging them to the owner.

Q. 50. For what further brake defects are delivering roads responsible?

A. For wooden brake beams on cars intended to be equipped with metal brake beams and so stenciled (see Rule 43, under "Bodies"); and for damage to any part of the brake apparatus caused by unfair usage, derailment or accident, also missing material on cars offered in interchange.

Q. 51. If a car should be equipped with air signal pipes or air brake pipes, but not with air brakes, at whose risk would the hose and couplings be?

A. At the owner's risk unless the car is stenciled as being so equipped, in which case the answer to Question 52 applies.

Q. 52. What is the rule in regard to the use of M. C. B. standard air brake hose?

A. If cars are not so equipped subsequent to March 1, 1908, the car owner is responsible except on cars offered in interchange in which case the delivering road is responsible.

Q. 53. When was it necessary to have all cars equipped with air brakes?

A. On and after September 1, 1907, all cars offered in interchange had to be equipped with air brakes.

Q. 54. What is the sixth subject treated of in "Instructions for Inspectors?"

A. Car bodies and the defects of same which justify repairs or carding.

Q. 55. For what defects to the body of a car are its owners responsible?

A. Locks, side doors, end doors, roof doors, grain doors, and all inside or concealed parts of cars missing or damaged under fair usage, and failure or loss, under

fair usage, of any part of the body of the car except in the cases named in Rule 87 (where only the labor of repairing is charged), and Rule 41. Further, couplers not within the limits of height (see Question 56 and answer thereto), steps, ladders, handholds or running boards in bad order or insecurely fastened, or absence of grab-irons or handholds as required by law.

Q. 56. What does the limit of height of couplers mean?

A. That the distance from the top of the rail to the center line of the coupler shank must not be less than 31½ inches nor more than 34½ inches, for a standard gauge car.

Q. 57. Of what material are handholds or grab-irons to be made, and how secured to car?

A. They must be made of steel or wrought iron and securely fastened with lag screws or bolts.

Q. 58. For what defects in the body of a car is the delivering road responsible?

A. For damage of any kind caused by unfair usage, derailment, or accident. Further, for all missing material on cars offered in interchange (except the locks, grain doors and interior or concealed parts already shown to be chargeable to owners),* M. C. B. couplers not equipped with steel or wrought iron knuckles. Wooden instead of metal brake beams, if car is stenciled for the latter. Further, for M. C. B. couplers, attached by tail pin on cars intended to have pocket attachments and so stenciled, and for uncoupling attachments (release rig) of M. C. B. couplers, if inoperative when offered in interchange; they must be made operative before moving from interchange points.

*See answer to Question 55.

Q. 59. For what defects is the company making the repairs responsible?

A. A company is responsible to the owners for improper repairs.

Q. 60. Are there any exceptions to this rule?

A. Yes; the cases provided for in Rules 33, 42, 43, 44 and 45, which treat respectively of M. C. B. couplers not equipped with steel or wrought iron knuckles; wooden in place of metal brake beams; cars having wrong tail end attachments and for M. C. B. couplers with inoperative release rigging.

Q. 61. When a company is obliged to make improper repairs, what must it do to call attention to such repairs?

A. It must attach an M. C. B. defect card to the car stating the wrong material used.

Q. 62. What is meant by the expressions "unfair usage" or "rough usage," which have occurred in some of the foregoing questions and answers?

A. Such usage of a car as gives rise to damage other than that due to the ordinary and careful handling of the car; usually careless handling and rough shifting.

Q. 63. How can the question be decided as to what is fair and what is unfair usage?

A. The M. C. B. rules give a number of combinations of injuries to a car which in practice are held to show that the car must have received unfair usage. They are fully described in Rules 48 to 56 inclusive. The following graphic table shows at a glance what combinations of injuries constitute unfair usage under the rules.

Q. 64. What instructions come next in the M. C. B. code?

A. Rules 57 to 79 contain instructions to repair men, showing them what repairs to make and what material to use. They are very important rules, and should be carefully studied.

Q. 65. To what does Rule 57 relate?

A. It defines the defects of cars which should be repaired.

UNFAIR USAGE OF CARS.

Damage to one or more parts on left side of each bracket, if accompanied by simultaneous damage to one or more parts on right side of same bracket, is considered unfair usage, and car owners are not responsible.

RULES

48—Coupler { Coupler Stop, Filling Block. / Draft Timber or its Substitute. / End Sill.

49—Coupler Pocket { Draft Timber or its Substitute. / End Sill.

50—Coupler Stop, Filling Block { Coupler. / End Sill.

51—Draft Timber or its Substitute. { Coupler. / Coupler Pocket. / End Sill.

53—End Sill { Coupler. / Coupler Pocket. / Coupler Stop, Filling Block. / Draft Timber or its Substitute.

54-55—Longitudinal Sill { Longitudinal Sill. / End Sill.

56—Damage to Corner and End Posts, if necessitating replacement of, or repairs to, more than two end or two corner posts at one end, or more than one end and one corner post at same end of car, is unfair usage.

NOTE—The word "coupler" in the above rules, means the coupler body or knuckle.

" An American continuous draft key shall not enter into a combination of defects denoting unfair usage.

" It will be assumed that a missing coupler and attachments are damaged unless shown to the contrary. This only refers to cases where the coupler, if broken would enter into the combination of defects.

If necessitating replacement of, or splicing of more than two sills in a car.

Q. 66. What is the nature of these defects?

A. Any defect in a car which makes it unsafe to run, unsafe for trainmen, or unsafe to any suitable lading.

Q. 67. In making repairs to foreign cars what general principles should be observed?

A. The repairs should be promptly made to prevent unnecessary detention to the cars; the repairs should also conform in detail to the original construction of the car and should be made with the same quality of material as originally used, except as provided for in Rules 59 and 60. Malleable iron, M. C. B. standards, may be substituted for gray iron, M. C. B. standards, but the net cost to car owner in such cases must be no greater than if the original kind and weight of material had been applied. Gray iron, M. C. B. standards, may be substituted in place of malleable, M. C. B. standards, but in such cases the debits and credits must be for what is actually applied and removed. Repair cards and stubs must state kind of material applied and removed.

Q. 68. Suppose it is not possible to procure the same material as originally used, what can be done?

A. The rules provide for certain exceptions which are likely to occur.

Q. 69. What are some of these exceptions?

A. M. C. B. standards may be used when of dimensions that do not impair the strength of the car, in lieu of the parts forming its original construction. When using materials for repairs to foreign cars for which the Master Car Builders' Association has adopted specifications as a standard, the materials must comply with the requirements of these specifications.

In making repairs for which owners are responsible, wheels other than 33-inch may be replaced with 33-inch

wheels, if practicable. If changes are necessary in order to bring the car to the proper height, the cost of so doing shall also be chargeable to the owner.

Couplers other than M. C. B. Standard, may be replaced with M. C. B. couplers in which case the expense may be charged to the owners.

Couplers that exceed the distance of 5⅛ inches between point of knuckle and guard arm measured perpendicularly to guard arm must be repaired. (See cut shown in Rule 61.)

M. C. B. couplers of a different make may be applied, but when this is done, and the release rigging already on the car is inoperative for the M. C. B. coupler applied, the release rigging must be made operative at the expense of the company applying the coupler.

Q. 70. Is it ever allowable to use second-hand materials in such repairs?

A. Yes, when they are good and serviceable, second-hand M. C. B. couplers, knuckles and metal brake beams and wheels and axles may be used, but if the repairs are chargeable to the owner the repair card and stub must plainly state whether the material is new or second-hand.

Q. 71. When the repair man finds a car of wrong height for couplers, what can he do?

A. He may adjust the height to the standard and charge the expense to the owners.

Q. 72. What is the standard height?

A. 34½ inches when the car is empty, or 31½ inches when loaded.

Q. 73. How is that height measured?

A. From the top of the rails to the center of the coupler shank.

Q. 74. Must the adjustment be exactly to these heights, or is any variation allowed?

A. The adjustment should be as exact as possible, but a total variation of ¼ inch is allowed by the rules.* In case of adjusting a loaded car, it should be adjusted as nearly as possible to such a height as will bring it to 34½ inches when unloaded.

Q. 75. May draft timbers be spliced?

A. No; draft timbers should never be spliced.

Q. 76. May sills be spliced or must they be renewed?

A. All longitudinal sills may be spliced once.

Q. 77. How are the splices to be made?

A. Longitudinal sills, other than center sills, when less than 12 inches in depth, the plan shown in Fig. 8 (see code) is to be followed; when the sills are 12 inches or more in depth the plan shown in Fig. 9 (see code) is to be followed.

Q. 78. Where may the splice be located?

A. On either side of the body bolster, but the nearest point of the splice must not be within 12 inches of the bolster.

Q. 79. How are center sills to be spliced?

A. When center sills are spliced the plan shown in Fig. 9*a* (see code) is to be followed.

Q. 80. Where must the splice in center sills be located?

---

*Cars should, as far as possible, be adjusted in height when empty; and, in order to justify a bill for this work under the Rules of Interchange, an empty car measuring 31½ inches, or less, should be adjusted to 34½ inches, or within ¼ inch thereof; and when it is necessary to alter a loaded car it should be adjusted to 33½ inches, or within ¼ inch thereof, or as nearly as possible to such height as will bring it to 34½ inches when the car is unloaded.

A. Between the body bolster and cross-tie timbers and not within 30 inches of either.

Q. 81. May any number of splices be used?

A. No; it is not allowed to splice two adjacent sills at the same end of the car, nor to splice any sill between cross-tie timbers.

Q. 82. How are steel sills to be spliced?

A. Steel sills may be spliced as shown below in Figs. A, B and C. (See Rule 65, code.)

Q. 83. What should the repair man take especial note of in regard to wheels?

A. Wheels on the same axle must be of the same circumference. New wheels must not be mated with second-hand wheels. Prick-punching of the wheel seat is not allowed, nor shimming the axle to make the wheel fit.

Q. 84. How much may be turned off from a foreign axle to fit a wheel to it?

A. On the wheel seat not more than 1-16 inch may be turned off to fit the wheel, and they must never be reduced below the figures given in Rule 23, which range from 6¾ inches for a 100,000-pound car, to 4¼ inches for a 30,000-pound car, for the wheel seat.

Q. 85. Who is responsible for repairs made with wrong material?

A. The company repairing foreign cars with wrong material and not in compliance with Rules 57 to 71, is liable to the owners of the car for the cost of changing the car back to the original standard or to the requirements of this rule.

Q. 86. Is there any exception to this rule of responsibility?

A. Yes; one. If the car is not stenciled with its ca-

pacity, and the company making the repairs applies an axle smaller than the one designated in Rule 23, for the capacity of the car, it cannot be held responsible for improper repairs.

Q. 87. What is the rule about replacing air-brake hose?

A. In replacing air-brake hose on foreign cars, for which bills are made, new hose must be used. Air-brake hose applied to foreign cars shall be considered wrong repairs unless they are made in accordance with the M. C. B. specifications and are so labeled.

Q. 88. If a railroad company finds a foreign car on its line with wrong weight stenciled on it, should the car be reweighed?

A. If the weight of a car is found to vary more than 500 pounds from the light weight stenciled on the car a railroad company having the car in its possession may weigh and restencil the car, making a charge for each car weighed and so reported. The railroad company making the bill shall notify the owner, giving the date and point at which the reweighing was done.

Q. 89. Are there any other occasions when foreign cars should be weighed?

A. Yes. Cars undergoing extraordinary repairs, such as sills, resheathing, roofing, etc., must be reweighed and restenciled by the company having the car in its possession, at its own expense, and the owner notified.

Q. 90. What is the rule in regard to applying second-hand axles?

A. When second-hand axles are applied under conditions which make them chargeable to the owners, the diameters of the wheel seats and center must not be less than, and the diameter of the journal must be ⅛ inch

greater than the limiting diameters given in Rule 23. If cars are marked with the word "Capacity," the first set of limits must be followed. If cars are marked "Maximum Weight," the second set of limits must be followed.

Q. 91. How are switch chains handled at interchange points?

A. When two or more cars chained together, or any cars which require switch chains to handle them, are delivered at an interchange point, the receiving road shall deliver to the delivering road at the time, an equivalent number of switch chains of the same size as the chains so used on the cars delivered, or. in lieu thereof, furnish a defect card for such chains.

Q. 92. What is a repair card?

A. It is a card 3½ inches by 8 inches, with duplicate stubs 3½ by 4 inches, printed on both sides in black ink.

(See diagram, Rule 77, code.)

Q. 93. Are these the same cards as those described in Rule 3?

A. No; they are entirely different and for a different purpose. The card described in Rule 3 is called an M. C. B. Defect Card, and the one we are now speaking of is called an M. C. B. Repair Card.

Q. 94. How are these cards used?

A. When repairs of any kind are made to foreign cars, a repair card is securely attached to the outside face of intermediate sill between cross-tie timbers on wooden cars and on steel cars to cardboard located either on cross-tie under car or on inside of side sill at the end of car.

Q. 95. How must the card be filled?

A. In ink or black indelible pencil.

Q. 96. What must this repair card show?

A. It must fully specify all of the repairs which have been made, and the reason for making them, and must give the date and place of making the repairs and the name of the road making them, also show location of parts repaired or renewed. The end of car on which brake staff is located shall be known as "B" end, and the opposite end as "A" end. Where there are two brake staffs on the car, the end toward which the cylinder push rod travels shall be known as "B" end.

Q. 97. What is the purpose of the repair card?

A. To show where the repairs were made so that responsibility for improper repairs, if any, can be placed.

Q. 98. If the car owners find repairs improperly made what is done?

A. They make claim on authority of joint evidence against the road which made the wrong repairs.

Q. 99. What is "joint evidence"?

A. The evidence of a joint inspector or the joint evidence of two persons, one representing the owner of a car, and the other representing the delivering road, that the repairs are not proper, shall be final. A joint evidence card shall be used for this purpose. The end of the car on which the brake staff is located shall be known as "B" end, and the opposite end as "A" end. Where there are two brake staffs on the car, the end toward which the cylinder push rod travels shall be known as "B" end. This card shall be of the form shown in code Rule 85.

Q. 100. If the repair card goes away with the car, what record has the repair man?

A. The repair card is provided with duplicate stubs, which must be filled out with an entry duplicating all the information on the card.

Q. 101. What is finally done with these stubs?

A. One stub is kept by the company issuing the card, as a permanent record, and the other is forwarded with the bill for repairs, and is used as a check on the charges.

Q. 102. If no bill is to be rendered, what is done with the stub?

A. In this case it must be forwarded to the owner on or before the 20th day of each month and the words "no bill" written across the face. When no bill is to be rendered the words "no bill" must be written across the face of the repair card when it is attached to the car.

Q. 103. What special information must be shown on repair cards and stubs?

A. The cards and stubs may state whether solid or filled journal bearings are applied or removed, also length of bearing. In the case of couplers applied and removed, they shall state the make and kind of material in couplers and the size of shank. In the case of knuckles, they must state whether open or closed knuckles are removed and applied. In the case of brake shoes removed and applied, they shall state the kind of shoe.

Q. 104. If a road makes only part of the repairs which are covered by a defect card, what should be done?

A. Any road making partial repairs of defects on a car which are covered by defect cards, will have the defects repaired, crossed off the original card with ink or indelible pencil and card placed back on car. A copy of the card accompanying the bill with the defects which were not repaired crossed off will be sufficient authority to bill.

Q. 105. What is done in case a repair card is lost or is illegible?

A. A duplicate must be furnished.

Q. 107. What is covered by Rule 85?

A. Joint evidence of wrong repairs which is referred to in Question 99.

Q. 108. To what does Rule 117 refer?

A. To switching roads.

Q. 109. What is a switching road?

A. A corporation doing the major part of its business on a switching charge, and therefore should be held responsible for all damages to cars handled by it, with certain exceptions.

Q. 110. What are these exceptions?

A. Switching roads, according to Rule 115, may render bills against car owners for the following defects repaired by them: Roof lost on account of decay or faulty construction, worn out brasses, broken truck springs, truck transoms, arch bars, draft timber bolts, column bolts, truck hangers, truck transom truss rods, truck bolsters, truck bolster truss rods, oil boxes, spring planks, truck hanger pins, side bearings and center plates, center plate bolts, center pins, followers, American continuous rods, or keys, draft springs, couplers, knuckles and drawbar pockets and rivets, defective wheels as specified in Rules 7 to 18, inclusive, defective axles as described in Rules 22 and 23, cars not within the limits of standard height for couplers, as per Rule 38, safety appliances as prescribed by Rule 39, and grain doors and all inside or concealed parts of bodies of cars missing or damaged under fair usage as prescribed in Rule 37, provided the damage has not been caused by derailment or rough usage.

Q. 111. What should be done if a car is offered by a switching road with new defects of any kind, except those named in Rule 117.

A. A defect card should be demanded from the switching road to cover such defects.

Q. 112. Are switching roads allowed to render bills against owners direct for repairs of any other defects than those named in Rule 117?

A. Yes; but only when the switching road procures joint evidence from the delivering road that such defects existed when the car was delivered to the switching road.

Q. 113. What is the subject of Rule 125?

A. Rule 125 gives instructions for sending home worn out and damaged cars.

Q. 114. What are the instructions?

A. A car unsafe to load on account of general worn out condition, due to age or decay, shall be reported to its owner who must be advised of all existing defects.

Q. 115. Then what is done?

A. If the owner wishes the car sent home, two home route cards are furnished, 3½ by 8 inches, of the form shown in code, Rule 125, which shall be filled out on both sides with ink or indelible pencil and attached to each side of the car.

9. What do the remaining rules cover?

A. Instruction for billing, scale of prices, settlement for cars destroyed, a code of rules for the interchange of short passenger cars, and a list of railroads which have adopted the code.

NOTE: Station Agents, Car Inspectors or others having use for charts showing parts of cars, and other useful information may obtain the same free by addressing, The McConway & Torley Co., Pittsburg, Pa., the original publishers of the foregoing catechism.

FAST FREIGHT SYSTEMS

THE RED BALL SYSTEM OF HANDLING FAST FREIGHT.

This service is intended for carload shipments under general classifications as follows: Asiatic, perishable, refrigerator cars under ice, bonded merchandise, and all mixed freight in carloads or less included in the Red Ball commodity list. Cars which contain freight which is not specified as Red Ball commodities is not given this special fast freight service, as a rule, unless it is so directed by the proper officer.

On one large railway certain stations are designated as Red Ball billing stations and they are known by certain letters. These are assigned a series of numbers for use in numbering the envelopes in which are carried the waybills for Red Ball cars. On both sides of each car a card is attached (7x9 inches), which has a red circle printed upon it, and upon this is set in white the number of the train of which the car or cars is to form a part. When a car reaches its destination the cards are, of course, removed. A special envelope, color red, accompanies each car, whether it be loaded or empty, which is handled as Red Ball freight. To the envelope which is to accompany the car to be left at a point nearest to the starting place is given the opening or first symbol number, and the envelopes for cars destined for points beyond are given succeeding numbers in consecutive order.

The agent prepares what is known as "consist report" before the train leaves a Red Ball station, which he makes up from the information given upon the special

envelopes. It should show the symbol letter (or letters) and number, car number and initials, its contents, the consignee and its destination. Should it be intended for some point beyond the company's line the report should also show what junction point the car will be delivered at, and the routing beyond that point should be given. This report is usually wired to the proper officer within one hour of the departure of the train from the station, and a copy of it sent by first passenger train mail.

In case for some cause a Red Ball car is set out en route, a form is used which is generally known as a "set-out car" which, when it has been properly filled out, is attached to the face of the special red envelope for that particular car. This form is most always green in color and for convenience is gummed on the back.

The conductor leaves the envelope with the beforementioned form attached with the telegraph operator at the point where the car is left. The information is then wired without delay to the proper official. But should it become necessary to set out a car at a blind siding, the report is sent from the next telegraph station, as in that case the envelope and attached form is left there by the conductor. After a car has once been set out, and has been held for another train, that car must not again be set out for any cause other than bad order. In the event it becomes necessary to transfer the freight to another car, the requisite information is set forth upon the envelope, but the original symbol and letter and number remains unchanged until the freight reaches its destination. These symbol letters and numbers serve to identify Red Ball freight throughout the journey despite what delays may occur. It will be noticed that

in the station reports full information is required, such as consignee, commodity, and so on, but a "set-out car" report calls only for car symbols and numbers.

Agents or yardmasters are expected to immediately notify the proper officer by wire when Red Ball freight cars which have been delayed are being sent forward. They should give the symbol letter, numbers, and number of the car (or cars), and the number of the new train into which it is put. But in case a set-out car is sent forward again upon the same date and by the same train in which it arrived no report need be sent.

At division terminals and also at other stations which have been designated, agents or yardmasters are expected to wire the proper officer advising when trains or cars of Red Ball freight are passing; but the highest and lowest symbol numbers of the letter shown on Red Ball envelopes is all that is necessary. If a break in the series occurs, two series are used, the first terminating with the number preceding the missing symbol.

A similar report is made when cars arrive at destination, at junctions on the company's line, or at other points where the cars leave the company's line for some other, but freight billed to local and branch line points is reported only as far as the division terminal or the branch line junction point. The agent and the proper official then becomes responsible for the prompt forwarding of the car by the right train to destination, and for the arrival at destination as nearly as possible on time.

At intermediate stations Red Ball freight is sent forward to the first division terminal by local train, to be there switched into the proper Red Ball trains. When a car entitled to Red Ball billing originates at a non-Red Ball station the agent wires the agent at the near-

est Red Ball station upon the route, and when it arrives there it is handled the same as though it had originated there. Local merchandise cars which are travelling as Red Ball are "Red Balled" to the last division terminal reached before distribution begins. Agents at such terminals are held responsible for the prompt forwarding of the cars. To determine whether or not freight in transit is Red Ball, agents at division terminals should closely examine all waybills.

On one great railroad the movement of Red Ball freight is made under the immediate supervision of the General Superintendents of their respective districts, but each is expected to immediately notify the other having jurisdiction over a connecting district concerning the movement of all such cars routed over that division. Loaded cars in transit on the railway in question are diverted only by the general freight claim agent, the station agent who makes the diversion has to wire the General Superintendent of that particular district the name of the new consignee, destination and routing.

It is necessary to prohibit the tracing of these shipments by wire, because its entire movement is reported and governed by wire. But in case of urgent importance a wire tracer is permissible, if sent to the proper official. Being reported all along by wire, the theory is that tracing by wire has no effect upon this class of freight, as tracers are merely regarded as requests for information of location, movement or arrival. When tracing is done it is by means of a code, the inquiry is made of the superintendent most likely to have the car on his division, who passes it on to the next superintendent if it has gone beyond his jurisdiction, but in so doing the message is put in a form which makes clear

who desires the information, so that the reply may be sent directly to the source from which the initial inquiry came.

If the freight is destined to a point beyond the company's lines, delivery to the connecting line is reported, followed by a report of its ultimate destination, by mail, should it be necessary. The symbol letters given to trains are according to their points of origin and the dates of their departure, and, as before stated, these serve to identify them throughout the entire trip to their destination.

EXPEDITING MOVEMENT OF MANIFEST FAST FREIGHT.*

"In the first place, it is necessary to define what is meant by 'fast freight' and what commodities are considered 'fast freight' and eligible for movement in 'fast freight' trains. Each agent is provided with a small book of instructions covering the use of the blanks and the reports, and also showing the commodities eligible for movement in 'fast freight' trains, and the commodities eligible for movement in 'time freight' trains. For instance, perishable goods—such as meats, dairy products, merchandise, etc.—are 'fast freight;' sugar, rice, coffee, and machinery are 'time freight.'

"'Manifest freight' moves on a train scheduled at approximately twenty miles per hour; 'time freight,' on a train scheduled at about twelve miles per hour. The tonnage that the engine can haul on 'manifest' trains at twenty miles per hour is about 30 per cent less than the tonnage which the same engine can haul of 'time

*John M. Daly.

freight' scheduled at twelve miles per hour, on account of the higher rate of speed; hence, it is more expensive to transport these high-class commodities than the lower grades of freight. For instance, the agent at New Orleans loads a car of sugar for Chicago, also a car of potatoes at the same point. In billing the car of sugar, he takes the 'time freight' way-bill, printed in blue, and uses it to carry the car through to Chicago. On the car of potatoes he will use the 'manifest fast freight' way-bill printed in red. If he also loaded a car of lumber, grain, coal, or any other low-grade commodity, he would bill it on the ordinary way-bill, and would use neither the 'time freight' nor the 'fast freight' way-bill for it, as such commodities are not eligible for billing under the 'fast freight' system of movement, in either of the above designated classes of trains, except where they are used to fill out such trains in the absence of sufficient of their assigned commodities.

"In addition to these way-bills, the yard clerk places a small card on the side of the 'fast freight' and 'time freight' cars. On the 'fast freight' car the card used is printed in red, the same as the way-bill; on the 'time freight' cars the card is printed in blue, as is the case with the way-bill.

"This separate way-bill for each car is used in order to give to each car an individual identity and rights in the train. Thus, in case the car is set out at any point, the way-bill must be left with the agent at the station where the car is set out, and its peculiar construction and color will immediately call his attention to the fact that it is an important shipment which must not be delayed. If the agent fails to notice the importance of the shipment from the way-bill in the rack, the yard master, or

switchmen, in going through the yard will locate the car by the card on its side.

"Again, should a car billed 'manifest freight' reach the end of a district, and the yard master fail to put it into the proper train to take it beyond, the clerk giving out the bills to conductors would discover the error of the yard master by noticing this particular way-bill, with its peculiar form of identification, in the rack after giving the conductor all the bills he called for. He would then call the yard master's attention to his error, and, possibly, succeed in getting the car into the proper train before its departure, thereby avoiding a delay to the shipment and, later on, an investigation.

"In this, as in every other branch of the service, *system* is at the foundation. By making the envelope for this way-bill of a special size, by printing the way-bill in red or blue, and by carding the car with the plain letter *M,* printed in red or blue, a particular identity is given it. Thus, also, anyone handling such car is notified that it should receive special attention. If no card were put on it, and the way-bill were the common way-bill used by railroads, only with a notation on the face or in the corner of it to the effect that it was 'manifest freight' or 'time freight,' then we should not be assisting the switching crews, yard masters, agents, and conductors, in handling the cars as they should be handled or as we desire, and we should be creating openings for delays, instead of guarding against and preventing them.

"After these high-class cars have been loaded at the house, or on team tracks, the bill clerks make up the special way-bills, filling out the blanks for 'Station from,' 'To,' 'Contents,' and 'Consignee.' The letter in the small diamond and the manifest number are not

put on the bill until the train is made up and ready to go forward. For example, on the Illinois Central Railroad, all the high-class commodities for the East from the terminal or adjacent points are assembled in the shaping-up yards in Chicago during the day and evening, then switched together into the proper assigned trains, and when the train is made up, the way-bills are passed to the yard clerk, who sorts them out so that the car in the train destined for the nearest point will receive the lowest way-bill number. For instance, we have in this train, say, one car for Cleveland, one car for Buffalo, one car for Albany, and twenty-seven cars for New York. The way-bill for the car destined for Cleveland is the first, for Buffalo the second, etc., so that, when the car for way-bill No. 1 is left at Cleveland, the agent can report its receipt without disturbing the consecutive numbering of the remainder of the way-bills. After the yard clerk at Chicago has numbered these way-bills, he makes his report on a 'Form 35,' which shows the manifest number assigned; e. g.: No. 1 for Illinois Central car 52480, destined for Cleveland, with butter and eggs; No. 2 for car destined for Buffalo; No. 3 for car destined for Albany; and Nos. 4 to 30, consecutively, for cars destined for New York. The yard clerk then sends this report to the Superintendent of Transportation, in whose office the board is located.* The man in charge of the board takes a train block, marked, say 51, that being the number of the train. He takes Chicago's pegs numbered 1 to 30 and inserts them in this train block. Under peg No. 1 he puts the letter *D*, which shows it is destined for Cleveland. Under peg No. 2

*In delivering his lecture Mr. Daly exhibited "A model board" here referred to.

he puts the letter *B*, which is Buffalo's cipher, showing the car to be destined for Buffalo, from Chicago. Under the next peg he places the letter *A*, which signifies Albany. Under the rest is the letter *N*, or New York's cipher.

"This block, or train, when made up after this fashion, is placed on the hook (on the board) between Chicago and Cleveland for trains moving in the eastbound direction. When our train reaches Elkhart, the yard clerk takes the way-bills, runs through them, and finds that they are numbered consecutively from 1 to 30. He then reports by telegraph to the Superintendent of Transportation: 'Manifest C-1 to C-30, arrived 2:00 A. M., left at 2:30 A. M.' Upon receipt of this No. 37 report, the man in charge of the board checks it against the train and finds it O. K. He then passes the train block from the district Chicago to Elkhart over to the district Elkhart to Toledo, and puts this report in the drawer under the station named Elkhart, so that, in case he wishes to locate any particular car in the train, he refers to the No. 35 report from the agent at Chicago showing the manifest number assigned the individual car; and then, by referring to the Elkhart drawer, he can determine the time it arrived and left that point. In this manner the actual location of a car within two or three hours can be readily ascertained without further inquiries, making it a very valuable system for patrons of roads using it.

"On the arrival of the train at Cleveland, the agent will report on the Form 37 as follows: 'Manifest C-1 arrived at 5:00 P. M.————————,' leaving blank the forwarding column, for the reason that the car is destined for Cleveland and does not go forward. He next

shows: 'Manifest C-2 to C-30 arrived at 5:00 P. M., left at 5:30 P. M.'

At Cleveland the yard master adds five additional cars to the train. He telegraphs the Superintendent of Transportation the manifest number assigned each of these cars, the initial and number, and destination, on the No. 35 report, as was done at Chicago. The clerk in charge of the board, upon receipt of this No. 35 report, places in this same train Cleveland's manifest pegs numbered 1 to 5, or 51 to 56, as the case may be, with the proper destination pegs under them.

"When the train arrives at Buffalo the agent at that point will report: 'Manifest C-2 arrived at 3:00 A. M. ————————,' that being the car from Chicago for Buffalo. 'Manifest C-3 to C-30 arrived at 3:00 A. M., left at 3:30 A. M. 'Manifest D-51 to D-56 arrived at 3:00 A. M., left at 3:30 A. M.', the last five being the Cleveland cars, *D* being Cleveland's initial.

"In case one of these cars was damaged or rendered unsafe for movement in the train at Laporte, Ind., and it was necessary to set it out at that point for repairs, the conductor in charge of the train, when leaving the way-bill for the car, is obliged to telegraph the Train Master in charge of the district between Chicago and Laporte, and also the Superintendent of Transportation, to the effect that he 'Set out Manifest C-11 at Laporte on account of rough journal (or for any other cause).'

"When setting the car out, the conductor leaves with the agent at Laporte this manifest way-bill for C-11. The man in charge of the board will, on receipt of this notice, take peg No. C-11 out of the train and insert it in one of the small holes opposite Laporte station by running it through the paper telegraph notice, the peg in the

hole serving the same purpose as if the telegraphic advice were held on the board with nail or pin. This, of course, shows that there is a car of 'fast freight,' destined for New York, set out at Laporte.

"In case the conductor forgets or fails to give this notice to the Train Master and Superintendent of Transportation, on the arrival of the train at Elkhart the yard clerk finds that he has all of the way-bills consecutively numbered, 1 to 30, except Manifest C-11. He therefore makes his report as follows: 'Manifest C-1 to C-10 arrived at 2:00 A. M., left at 2:30 A. M. Manifest C-12 to C-30 arrived at 2:00 A. M., left at 2:30 A. M.' This naturally shows that the car for way-bill C-11 did not reach Elkhart, although it left Chicago in that train. The man in charge of the board will then take peg. No. C-11 out of the train block and insert it in any station on that district with a blank report attached to it, showing that the car was set out of the train at some point which he is unable to determine; and he immediately wires the Train Master to have the conductor state where he left it. It then becomes the duty of the Train Master to get this information, and also to have the car repaired and moved in some slow freight train through to Elkhart during the next twenty-four hours, in order that it may be placed in Train 51 when that train is made up the following morning, and avoid stopping the 'fast freight' train at Laporte to pick it up.

"It will be seen that, by giving to each car an individual way-bill and number, such car secures a separate and distinct identity, and is surrounded by checks; and also that, if the conductor should fail to report the setting-out of a car, the man in charge of the board will immediately detect it, and prevent any unnecessary de-

lay to the shipment by notifying the Train Master to look it up. If it were not for this individual check, the car would be overlooked and possibly remain sidetracked for a week, until some heavy damage claim resulted, which in turn would involve the conductor, and also the agent, in trouble for their failure to make a proper report. In other words, the object of the system is to prevent damage, and consequent loss, by forestalling delays instead of locating them after the damage has occurred.

"The system is also intended to check the movement of trains over the different districts, for the purpose of seeing that they make their running time, and to locate the districts or the terminal points where they fail to run up to their schedule."—John M. Daly, in "Railway Organization and Working."

Perhaps no better authority on this subject could be quoted than Mr. J. M. Daly, whose long experience has enabled him to take the iniative in several very important improvements in the operation of trains, not least of which is the system he has devised and put in operation as described by him in this chapter. He is fully qualified to speak and write on the subject of railway working in general and is an acknowledged authority.—[Editor's note.]

STATION REPORTS, CARS, FAST FREIGHT, MAIL SERVICE

RAILWAY MAIL SERVICE.

Modern railways have had a wonderful effect upon the mail service. Without railways the present high state of efficiency of the mails would have been impossible. At the time when railways were first put into operation the mail was carried on horseback, or by stages, or by post-coaches drawn by four horses, packets and steamboats. The rapidity with which mail could be transported depended very largely upon the speed and endurance of the horse, because the cities which could be reached by steamboats was comparatively few. However, even then, when the roads were in good condition and the weather was favorable, the mails were delivered on schedule time; but, of course, the schedule was slow enough compared with present day schedules. Although, under the exciting conditions which in the year 1833 existed, the express mail was carried by horses a distance of ninety miles, from Philadelphia to New York, in six hours, or at an average speed of fifteen miles per hour. But in order to maintain that speed the horses had to be changed every five miles, and as two horses were needed to carry the mail, seventy-two horses were necessary to perform each day's service, besides which, reserve horses had to be provided to fill the places of those disabled. The extraordinary conditions which then prevailed warranted that remarkable performance and the great outlay. The mail contractor was paid at the rate of one dollar per mile per horse, making a total sum greatly exceeding the amount received by the Post Office Department for carrying the mail.

More often, though, the ponderous vehicles—heavy stage coaches and post-coaches—were, in wet weather, down to their hubs in mud on bad, nay, almost impassable, roads with the horses tugging and straining in their frantic efforts to drag them along at the rate of three or four miles an hour.

With such conditions prevailing it might naturally be thought that as soon as railways were put in operation the carrying of the mails would have been transferred to them. But not so. As one writer has explained, the railways were not, for some years at least, any more expeditious or reliable than the post-riders, stages, and post-coaches. The authority alluded to thus describes the situation:*

"As late as the year 1835, or six years after the successful trial of the 'Stourbridge Lion' at Honesdale, the Postmaster General threatened to remove the mails from several of the leading railways, unless they were forwarded with greater expedition and certainty.†

"This threat to remand the mail contractors back to the stages may seem strange in view of the records made in the two famous prize contests of Great Britain and the United States. As early as October, 1829, in the great Rainhill competition, brought about by the Liverpool & Manchester Railway, Stephenson with the 'Rocket' is said to have attained a speed of twenty-nine miles per hour.‡ This record was soon equaled in our own country. During the summer of 1831 there was a contest just outside of Baltimore for the prize offered

*George Gerard Tunell "Railway Mail Service" in "Lectures on Commerce."

†48th Cong., 2d Sess., Senate Ex. Doc. No. 40, pp. 22, 23.

‡Stretton, The Development of the Locomotive, pp. 30-32.

by the Baltimore & Ohio Railroad. One of the contesting locomotives, 'The York,' built by Phineas Davis of York, Pa., after undergoing certain modifications, was found capable of running a short distance on a straight and level stretch of track at the rate of thirty miles per hour.*

"Too much, however, can easily be inferred from these records. In all probability they are only estimates, and something must be allowed for the great enthusiasm that prevailed. But in any case they were extraordinary performances, and stand in no higher relation to what could then be done, day in and day out, than the wonderful bursts of speed of today stand in relation to the everyday performances of our engines.

"The best locomotives now manufactured can attain and hold a speed for a short distance of certainly 90, and perhaps even 110, miles per hour, but the average running-speed of our fastest trains falls far short of even the lower of the figures. The running-speed of the fastest regular trains of the United States—and, it might be added, of the world—namely those between Atlantic City and Camden, is 66.8 miles per hour. This run is, of course, only a dash, the distance by the longer route being but 59 miles, with no stops between the termini. The running-speed of the Empire State Express on its journey of 440 miles from New York to Buffalo, deducting 8 minutes for the four station stops it makes, is 54.2 miles per hour, while the running-speed of the Northwestern and Burlington fast mail trains on their long journey of 490 miles from Chicago to Council Bluffs, allowing 35 minutes for thirteen station stops, is 51 miles per hour.

*The Great Railway Celebrations of 1857, p. 22.

"It was not until the first railways had been in operation for several years that the locomotive fully established its superiority over the horse in point of speed and reliability. Shortly after the opening of the first section of the Baltimore & Ohio Railway to Ellicott's Mills, or in the summer of 1830, Peter Cooper, running the 'Tom Thumb,' a locomotive of his own construction, was distanced by a powerful gray horse drawing a car which by this victory became famous, and later played a conspicuous role in the public prints and early books on travel. Of course, Cooper's discomfiture was due to an accident, the slipping of the belt that operated the blower. This, however, only emphasizes my point, namely, that the locomotive could not yet be counted on for regular performances. In this contest Stockton and Stokes, the owners of the horse, undoubtedly did their best, for they were the great stage-owners of that day, and were determined not to let their mail contracts slip without a supreme effort to retain them.

"That the average speed on the railways during the first decade of this form of transportation was little, if any, above that made by the post-riders and stages can readily be shown. Many of the contracts for the latter kind of service called for eight, nine, ten, and, we have seen, even as high as fifteen, miles per hour. The railroads scarcely did better. On March 28, 1835, the Post Office Department complained that 'the mail from New York to Philadelphia, by railroads, is usually late, taking more than thirteen hours from Jersey City. [And then added]: This was hardly the case in the worst of bad staging.'* On April 30 of the same year, in another letter of rebuke, the Postmaster General said:

*48th Cong., 2d Sess., Sen. Ex. Doc. No. 40, p. 23.

"'There have been two failures of the mail from beyond Philadelphia, at this city, in the course of the present week, occasioned, it is said, by accidents to the locomotive on the Amboy & Camden Railroad. These occurrences are peculiarly annoying at this time, and have become the subject of public notice and complaint. From the experiences we have had, the adaptation of the railroad to the purposes of mail transportation is becoming every day more and more questionable. It is very apparent that it cannot be relied on with that degree of certainty which is all-important in the transmission of the mail, and without which disappointments occur to the public, and complaints are rung in the ears of the Department from every quarter of the country.'*

"On November 24, 1837, it was ordered by the Postmaster General that one Hutchinson be offered $350 for the conveyance of the President's message, on the first Tuesday in December, by express mail from Washington to New York. This mail was to leave Washington at noon and reach New York at 4 A. M. the next day.† As the distance was about 230 miles, the average speed stipulated was a little less than 14½ miles per hour. On December 12, 1838, the Postmaster General approved the arrangement of the postmaster at Philadelphia for carrying the President's message by special mail on the railroad from Philadelphia to New York in five hours for $500.‡ In 1833 the mail was carried between these cities by the post-riders in six hours. As late as 1839 the mail trains on the South Carolina Railroad averaged less than 11 miles per hour in running from Charleston to Hamburg, a distance of 138 miles.

*Ibid., p. 23. †Ibid., p. 31. ‡Ibid., pp. 31, 32.

It will be remembered that this was the second railroad opened in the United States designed for a general freight and passenger business, and that it began to use the locomotive as early as 1830. And it seems the Postmaster General feared the trains might have difficulty in making even 11 miles per hour, for the contract covering this route stipulated that 'the way-mails are to be handed in and out, at the way stations, without stopping the cars entirely.'*

"While the examples cited show the railroads were but little superior to the post-riders and stages, they by no means present the railroad service at its worst. The railways I have selected were those first established, and connecting the principal cities, and therefore probably rendering the best service then to be found. Where the service extended over several railways it was even slower, for railway connections, unlike the stage connections, were very poor in those days. The running schedules of the different corporations seem to have been drawn up with the idea of making the breaks in travel as frequent and as long as possible. The traveler from Washington to New York, on arriving at Baltimore, would be likely to find that the train for Philadelphia had just departed, and on arriving at Philadelphia he would be likely to find that the train for New York had just departed.

"There was still another reason why the railways did not at first make much better time than the stages. In the early days, and for many years after the railways were established, the movement of trains during the night hours was very limited, and on almost all railroads was wholly suspended. This placed the railroad

*Ibid., p. 33.

at a great disadvantage, because the bulk of the mail—the morning papers did not then count for much—accumulated in the afternoon. The stages and post-coaches would start with it in the early evening, and where the distance was not great, as, for instance, between Baltimore and Washington, the mail would be at its destination about the time the train started the next morning. As late as October, 1841, some of the railways involved refused to adopt schedules urged by the Postmaster-General which would have very materially expedited the mail between Boston and Charleston, because they called for night running, and would not yield, although the Postmaster-General intimated Congress would indemnify them for the additional difficulties and expense incident to running in the night-time.* Shortly before this, one railway offered to carry the mail with night service at $300 per mile per year, and for $200 if the department would so arrange the schedules that the running would fall entirely between sunrise and sunset.†

"The chief reasons have now been presented showing why the railways did not, and could not, at once offer a mail service greatly superior to that they found in existence. During the first decade, and even later, it was a contest between a slightly inferior, but well-organized, mode of conveyance, which was in complete possession of the field, and which, by long years of service, had become nicely adjusted to the work required, and a slightly superior medium of transportation, but unorganized, disjointed, with little flexibility, and as yet wholly unadjusted to the work expected of it.

*Ibid., p. 41. †Ibid., p. 33.

"As I have already stated, the inability of the railways to give a service materially better than the one already at the disposal of the Post Office Department explains why the mail traffic was not more generally transferred to them than it was. In 1842 the mail was carried upon only 3,091 of the 4,026 miles of railway then in existence. In some few cases the mail was not transferred for other reasons than the inability of the railway to provide better service. The Postmaster-General reported that several railways demanded greater compensation than he was willing to allow. But, broadly speaking, I believe it can be said that the abandonment of the stages and the more complete utilization of the railways was due to the fact that, when all things were considered, the railway service was not sufficiently superior to the established service to render a change desirable. The predictions of the wonderful speed with which persons and intelligence would soon travel, made when the first railways were opened, had not yet been realized.

"But, notwithstanding the small progress that was made in the first decade of railway transportation, Horatio Allen was soon to be justified in making his decision, in 1829, in favor of the locomotive rather than the horse, as the motive power to be adopted by the South Carolina Railroad, then about to be opened. He took his stand, he said, 'on the broad ground that in the future there was no reason to expect any material improvement in the breed of horses, while . . . . the man was not living who knew what the breed of locomotives was to place at command.'* The stages and

*The American Railway, p. 104.

post-riders had nearly reached, if they had not already attained, the limit of their accomplishments. Fifteen miles an hour was too fast a life for even the toughest horse to endure it long.

"Although wonderful progress in railway transportation was not made for many years, enough was accomplished, however, to justify abundantly the predictions made by Horatio Allen and his fellow-pioneers. The discovery and utilization of the electric telegraph; the substitution of T-rails for the light strap, bar, and edge rails that had been laid on many lines; the heavier locomotives this made possible; better bridges; closer connections; the amalgamation of short antagonistic bits of railway into one harmonious line; and the more general operation of trains during the night hours—all these, and other factors not mentioned, so increased the effectiveness of the railways that the great stage lines fell out of the race. By 1850 a few railways for the accommodation of through mail and passengers ran trains at 25 miles per hour.* While this would not now be looked upon as rapid running, it represented a material improvement, and was fast enough to win the traffic for railways. Not much progress seems to have been made during the next decade, at least not on the great eastern lines. In 1860 the Postmaster-General reported that an experiment was made with a night mail between New York and Boston. This was one of the earliest attempts to unite several distinct companies, deriving their charters from as many different states, into one continuous line. The time between these two cities was reduced by this train to nine hours.† The

*48th Cong., 2d Sess., Sen. Ex. Doc. No. 40, p. 50,

†Ibid., p. 58.

distance being about 230 miles, the average speed maintained was but little more than 25 miles per hour. The service between New York and Washington was not so satisfactory as that between New York and Boston. Twenty miles per hour seems to have been all the department could secure from the railways forming this route.*

"More than thirty years have now passed since the first railway was opened for business. The great stage lines, once powerful competitors for the mail traffic, have ceased to exist, except in the far West. And even here the great overland stages are soon to be crowded out by the Central and Union Pacific railways, now rapidly approaching each other. But, notwithstanding the fact that the stages have long since disappeared from the other portions of the country, stage-coach methods of handling the mail are still in vogue. To utilize the new form of transportation in anything like full measure, a new system of separation should have been introduced. But there was little deviation from the stage-coach ways. The railroads hauled the mail practically as the stages had hauled it before them. But a great departure was about to be made. The mails were soon to be distributed in railway cars instead of stationary postoffices along the route. The car was to become something more than a mere vehicle of transportation. It was to be the place in which almost all the work of sorting and pouching was to be done and thus it was to become the backbone of a new system of handling the mail. Before taking up the introduction of the railway postoffice, which is the technical name for a car devoted to the distribution of mail, the system

*Ibid., p. 59.

the railway mail cars supplanted will be sketched in barest outline.

"The method of handling the mail in existence anterior to the introduction of the railway postoffice was built up about what were known as distributing postoffices. From the earliest days until the introduction of the railway postoffices the great problem which constantly vexed the postoffice officials was the sorting and pouching of the mails. Before the mail can be started on its journey it must be pouched. Now, obviously there cannot be so many pouches as there are places for which the mail is destined, because, among other reasons, the weight of the pouches would be so many times the weight of the mail that the means of transportation would be broken down. In many cases there would be a pouch for one letter. Under such a system the aggregate gross revenues of the Post Office Department for many years would not suffice to pay for the pouches. That these statements are true becomes apparent on a moment's reflection on the final destination of the enormous number of pieces of mail sent out every day from the Chicago and New York postoffices.

"In the very early days the problem of pouching the mail was not serious. The volume of mail was then surprisingly small. The mail generally went in one pouch. The stage drew up to the postoffice, which was usually also the tavern, and the postmaster went through the pouch, and, after removing what belonged to him, added what mail he wished to dispatch. This could generally be completed before the horses were exchanged and the passengers had refreshed themselves, and there was thus no delay of the mail. Even at the time the railroads made their appearance there was no widespread dissat-

isfaction with the way the mail was handled. The Post Office Department, under its contracts, regulated the arrival and departure of the stages, and when necessary they could be held until the mail was ready, and thus the mail generally kept pace with the passengers. So long as the movement of the mail was equal to the most rapid transition of the traveler, there was no complaint from the public. There are instances on record, however, where the patience of the travelers was exhausted. By making up a purse sufficient to indemnify him for the fine the department imposed, they sometimes induced the driver to abandon the mail.

"But long before 1830, the year of the opening of the Baltimore & Ohio Railroad, a single pouch ceased to hold all the mail on the heavy routes, and the simple methods that once obtained had given way to a more complicated system. As early as 1810 a law was passed authorizing the Postmaster General to establish distributing postoffices, and he accordingly designated thirty-five offices as distributing offices. So far as I can learn, these offices merely continued to do, but on a much larger scale, what they had already been doing for some time in a small way.

"As the tide of emigration spread over the Mississippi valley, and the number of postoffices multiplied, distribution became more and more difficult. Direct pouching, from each office to every other office for which there was any mail, became more and more impossible, because of the number of pouches that would be required. To keep down the number of bags, the mail was now sent to the distributing postoffices from all the offices in the territory of which this office was the center. Here the whole mass was sorted and pouched, and

then shipped to the various distributing offices scattered about the country, each one of which now acted as a distributing center, and made up and forwarded the mail to the smaller offices grouped about it. To make all this a little clearer, let us suppose the system to be still in existence, and that Chicago and Boston are distributing postoffices. If such were the case, the postmasters in the smaller cities around Chicago would send any mail they might have for Boston and the smaller cities grouped about it to Chicago, where all the mail for Boston and the territory of which it was the distributing center, would be put in one bag and sent to Boston, where the bag would be opened, the mail separated, and sent out to the surrounding offices. From this description of the work done in the distributing postoffices it is seen that the name 'distributing postoffice' was inadequate. It only described one of the two functions of the office. The initial massing of the mail was quite as important as the later distribution.

Although successful in keeping down the number of bags and pouches required in the transmission of the mail, the distributing postoffices soon became intolerable, because of the delays they imposed. In the stage-coach days, when the current of life moved slowly, they were in keeping with their surroundings; but in later times, after the railway communicated its quickened life to almost everything about it, the old order became unendurable. As I have before stated, so long as the mail kept pace with the passenger there was no complaint, but when the traveler starting from the same place at the same moment almost invariably reached a common destination one or two days before a letter, the patrons of the postoffice began to protest. In the illus-

tration that was introduced a moment ago, the letter, on reaching Chicago, would be taken to the postoffice, and in about ninety-nine times out of a hundred it would lose its eastern connection, and very frequently it would miss several connections; and when finally it did get to Boston it would again have to go to the distributing postoffice. The traveler, on reaching Chicago, would in many cases at once board an east-bound train, and very shortly be on his way. To these long breaks in the journey of a letter the people objected. Finally their protests became so numerous, loud, and emphatic that the officials were forced to look about for a remedy.

"At first the ax was laid at the root of the abuses that had grown up in and about the distributing postoffices. The emoluments derived by the postmasters at distributing offices consisted of a commission on the letters distributed. Originally the commission was 5 per cent. on letter postage, paid and unpaid. This was afterward increased by law to 7, and later to 12½, per cent. It was thus obviously the interest of the postmasters of these offices to increase their distributing business to the utmost; and, though expressly forbidden by the department to invite mail from its legitimate channel, this was nevertheless often done. Letters were frequently subjected to so many distributions that the postage paid on them was entirely eaten up. In some cases the commissions of the postmaster greatly exceeded the entire proceeds of his office, and a balance had to be paid him from outside sources.* In 1851 and 1852 the postmaster-general made a strenuous effort to correct these evils and abuses. He framed new regula-

*Ibid., p. 142.

tions designed to cut off unnecessary distribution, with its train of evils, and even went so far as to remove summarily several conspicuous postmasters for violating his instructions. The work begun by Postmaster-General Hall was carried on with vigor by Judge Campbell, who became postmaster-general in 1853. He caused copies of the distributing schemes used in the distributing offices, which were then about fifty in number, to be sent to Washington for examination. Mr. Henry A. Burr, the topographer of the department, to whom they were referred, found nearly all of them grossly defective and productive of unnecessary distribution, with its attendant delays and expense. By direction of the postmaster-general, Mr. Burr prepared new schemes, but in submitting them he expressed the opinion that, so long as the mails were stopped in transit for separation, no scheme of distribution could be devised which would give dispatch, or prevent passengers and express matter from outstripping the mail. The only effective remedy was the abrogation of the distributing post-offices and the transfer of the work of separation to 'over the car wheels,' as he expressed it. But the force of progress was yet too feeble to take this radical step. It was not long, however, before it was found that although Mr. Burr's scheme corrected many evils, it was inadequate, long delays still being very frequent. In 1857 another step forward was taken. In this year the number of cities to which there was direct mailing was greatly enlarged, and on the trunk lines the mails were placed in charge of what were known as 'express agents,' who went with the mail and saw that the pouches were properly transferred at junction points. This practice very largely

reduced the quantity of mail that had to percolate through the distributing postoffices, and, so far as it extended, prevented passengers and express matter from making better connections and thus outstripping the mail. Direct mailing having proved successful, it was so far extended by 1859 that thirteen of the fifty distributing offices were found unnecessary, and were accordingly abolished.

But even after these reforms were made, a very large portion of the mail moved in the old channels, with all the incidental delays. Only the mail between the favored cities was accelerated. The great object for which the Postoffice Department was now striving still remained unrealized, and the department hesitated to make the radical departure necessary to achieve it. The timidity and distrust of anything new which had so long characterized the department could not be shaken off in a day. But the first step had been taken, and the second had to follow. The department had placed before itself the ideal of giving the mail as great expedition as the most rapid transition of the traveler. This could only be secured by giving the mail at all junction points as close and perfect connections as the passenger could obtain for himself. This meant that on the arrival at Chicago of a mail train from St. Paul all the mail must be ready for immediate dispatch to the several railway stations to catch the outgoing trains, even though mail had been taken on but a few miles out of Chicago. If a passenger could take an omnibus or cab and catch a train, the driver of the mail wagon must get the mail there. In such a scheme there was no place for a distributing postoffice. The magnitude of the work that would have to be done in the cars, as well it might, caused the Postoffice De-

partment to hold back. But a start was to be made very soon. A condition had arisen in the West, where neither railway nor postoffice officials were so completely under the thraldom of old customs and regulations, which imperatively demanded a change. In July, 1861, the overland mails began to be carried over the Hannibal & St. Joseph Railroad,* this being the first railway to reach the Missouri river. The railroad being new, and the demands upon it being very heavy, on account of the war and the large influx of settlers, and its operation being difficult on account of the guerrilla warfare that existed, the trains were always late. St. Joseph being the most important distributing office in the West, an immense amount of mail arrived there every morning by the railway. The overland stages were scheduled to leave three hours after the train was due. All of this time was required for the distribution of the mail, so when the trains were late, the stages, which seem to have run with greater regularity than the trains, left with only a part or without any of the mail. An indefinite continuance of this state of affairs was not viewed with equanimity by Mr. William A. Davis, who had charge of the distribution of mail at St. Joseph. Despite the fact that he was a holdover from the *ancien régime,* having been forty years in the service, he still placed a very high value on promptness, and set about to find a way to overcome or offset the lateness of the trains. His remedy was to have the overland mail all ready for the stages when the train arrived. If this were done, the mail would not miss the stage, even though the train was full three hours late and the stage started promptly. To save this three hours he urged the postmaster at St.

*Ibid., p. 81.

Joseph, and through him the officials at Washington, to be allowed to meet the mail on its arrival at the eastern terminus of the railroad at West Quincy and separate the mail as the train proceeded on its journey across the state of Missouri. His requests were granted, and he seems to have lost no time in putting his plans into execution. On August 5, 1862, he wrote the second assistant postmaster-general a brief account of his experiment. He said:

"One of the clerks and myself left here on Saturday, 26th, so as to be in Quincy on Monday, 28th ultimo, to commence the distribution of the overland mail on the Hannibal & Saint Joseph Railroad. Finding that the mail cars had not been arranged according to promise made . . . instead of going to Quincy I proceeded to Hannibal, and succeeded in getting cars temporarily fixed, in which (though with some inconvenience) I think the work can be done until the new cars are ready. The distribution was commenced on Monday at Palmyra. and I assisted the clerk going up as far as Clarence, at which place I turned back with the clerk who had come down to go up on Tuesday; assisted up to the same point on Tuesday; turned back and distributed the mail going up on Wednesday myself. We have now got through with a week's service, and can confidently report that when the accommodations are finished that are promised by Mr. Hayward, superintendent of the road, the distribution can be done entirely to your satisfaction."*

"The promised cars were soon completed and put into service. From this humble beginning the service was

*Ibid., p. 143. Up to this time, although there had been some distribution of way-mail in cars, no attempt had been made to distribute through mail.

soon extended, and, fortunately, during its formative period the railway mail service was in the hands of very able men. Limitations of time forbid stating who they were and what they did.

"The next important advance in the railway mail service was made in 1875, and the credit for it belongs to Colonel George S. Bangs, who was then general superintendent. Mr. Bangs was a man of unusual energy, courage, and progressiveness, and to him more than to anyone else belongs the honor of thoroughly rousing the Postoffice Department to its great possibilities. His administration was epoch-making. It marked the end of the old and the beginning of the new order. Broadly speaking, before his time the department was a non-initiating body. Reforms were thrust upon it from without, and only adopted when inaction would no longer be tolerated. Since his administration the department has not only shown readiness to adopt improvements laid before it, but has also originated many.

"Up to the time Mr. Bangs became general superintendent of the railway mail service the officials of the Postoffice Department aimed no higher than to secure for the mail as great expedition as passengers could obtain for themselevs. Mr. Bangs was not content with this program. He hoped to obtain greater dispatch for the mail. The mail business had always been looked upon as an adjunct of the passenger business. Mr. Bangs hoped to secure exclusive mail trains, whose departure and arrival should be timed to suit the wants of the Postoffice Department. In 1874 he presented his views to Postmaster-General Jewell, by whom they were favorably received, and he was authorized to open negotiations with the New York Central & Hudson River and

the Lake Shore & Michigan Southern railroads for a fast mail service between New York and Chicago. For the account of the negotiation which follows, I am indebted to former Postmaster-General Thomas L. James:

"It was the old story of making bricks without straw. The Postoffice Department had no appropriation to pay for such facilities, hence it had to depend at first on the public spirit of the railroad authorities. Commodore Vanderbilt, the president of the companies whose lines were to be used, had had dealings with the Department, and was perhaps not altogether sanguine as to the practical issue of the experiment, or in respect to the countenance it would receive from Congress; but Mr. William H. Vanderbilt, the vice-president, lent a willing ear to Mr. Bangs's proposition, and did his utmost to aid him in putting it into effect. There being no special appropriation available for the purpose in hand . . . Colonel Bangs stipulated that if Mr. Vanderbilt would have twenty cars built and the service performed, all matter originating at, or coming into, the New York postoffice, which could reach its destination at the same time by this line, should be sent by this train, and that the railway companies could have the right to demand a weighing of the mail matter at will, all railroads being paid according to weight. When the details of the plan were communicated to Commodore Vanderbilt, he is reported to have said to his son, 'If you want to do this, go ahead, but I know the Postoffice Department, and you will, too, within a year.' Mr. Vanderbilt did go ahead! He constructed and equipped the finest mail train ever seen, . . . ran it for ten months, never missed a connection at Chicago, and was always on time at New York. He did not have to wait a year, however, for a

realization of the sagacious old Commodore's prophecy. Within three weeks, despite the indignant protest of Colonel Bangs, the mails of three states were ordered to be taken from this and given to another route. A grosser and more wanton breach of plighted faith it would be hard to find, and its results were far-reaching and disastrous."*

"The Pennsylvania Railroad, not to be outdone by its rival, also established a fast mail service, and thus there was a double service between New York and Chicago, and the outlook was bright for even wider extensions of the fast mail service, when Congress, in spite of the efforts of the Postoffice Department, passed an act reducing by 10 per cent. the already inadequate compensation to the trunk lines for carrying the mail. Very shortly after this act was passed, the postmaster-general received a letter from Mr. W. H. Vanderbilt, which, after reciting the conditions and circumstances under which the fast mail was inaugurated, closed as follows: 'Congress, by its recent action has expressed an unwillingness to provide suitable compensation for the service, and I am therefore obliged to notify you that the fast mail train between New York and Chicago will be discontinued on the roads I have the honor to represent, after Saturday, July 22, 1876.'† Mr. Thomas A. Scott, on behalf of the Pennsylvania Railroad Co., sent in a similar communication on July 15.‡ The Postoffice Department being unable to offer any relief, the fast mail service, which began so auspiciously on September 16, 1875, came to an end on July 22, 1876.§ Colonel Bangs

*The American Railway, pp. 318-20.
*48th Cong., 2d Sess., Sen. Ex. Doc. No. 40, p. 184.
‡Ibid., p. 183. §Ibid., p. 103.

was greatly disappointed at this abrupt undoing of all his labors, and worn out by never-ending toil, and disheartened by the action of Congress, he tendered his resignation and insisted on its acceptance.

"Though in operation less than ten months, the fast mail trains had been in existence long enough to establish themselves firmly in the esteem of the business world. They ran between New York and Chicago in twenty-six hours, making connections at all important junctions with trains to and from a vast territory, and thus advanced the mail by twelve, twenty-four, and even forty-eight hours for some sections of the country. The fast mail on the New York Central and the Lake Shore never missed a single connection, and was late at Chicago but three times, and at New York but once.*

"As may easily be imagined, the discontinuance of this admirable service caused a great deal of dissatisfaction and unfavorable comment. In the following year an effort was made in Congress to restore the service, and an appropriation of $150,000 was secured on March 3, 1877. This money was to be paid for expedited service, and became known as "special facility pay." With this appropriation the department was enabled to restore the fast mail trains. In 1884 several more fast mail trains were secured in other parts of the country without the use of special funds, and since the latter year the service has been so widely extended that there is now scarcely an important mail route in the country that does not have at least one fast mail train leaving at the time and run at such speed as will best meet the needs of the Post-office Department.

*Ibid., p. 103. There is a slight error in the statement of Mr. James.

"From a place in which there was no separation of the mail, the car has become the place in which nearly the whole of the work of separation is performed. The mail is now sent from the stationary postoffices with the least possible separation. Broadly speaking, the mail is now distributed for trains rather than for cities. This allows the mails to be kept open at the central office until almost train time, and it greatly economizes both space and labor in the central office. The through mails for the most part, do not even pass through the terminal postoffice. Unless the interval between their arrival and departure is a very long one, they are transferred directly from one station to another. I have been informed by one of the division superintendents of the railway mail service, that not more than 5 per cent. of the mail passing through Chicago is taken to the central office, the other 95 per cent. being transferred directly from one train to another.

"Although the mail is always received from the city postoffices undistributed, it is never sent to them from the railway postoffices in this condition, if this would involve any delay in the ultimate delivery of the mail. On the arrival in Chicago of the morning mail trains the letter mail for the business portion of the city is ready for the carriers, and the letters for the remainder of the city are sorted and are ready to go at once to their respective stations. The postmaster-general recently said: 'It is the intention eventually to absorb all the work of city distribution into the Railway Mail Service whenever the mails can be expedited thereby.'*

"The ideal railway mail service of Colonel Bangs is now a reality. The mail on nearly every railroad in the

*Report of the Postmaster-General, 1895, p. 398.

United States is now the favored traffic. The mail goes on the fastest trains; the mail trains are given the right of way over all other trains; the mail is carried on any train the Postoffice Department may select; no mail is ever left behind, the railways always furnishing sufficient car space regardless of the suddenness of the demand that may be made; the mail cars are furnished with the best appliances that art and science afford; the mail cars are placed in the station where they can be conveniently approached; the railroads carry the mail between their stations and the postoffices; and finally, the railroad employees give the mail their first attention on arrival of trains."

APPENDICES

Specimen Blanks or Forms Used in Railway Station Work

The forms here shown as appendices are those used in the handling of cars on railways. They comprise forms used in the Car Service Department, including the movements of cars; Demurrage and Storage; and Car Accounting.

APPENDICES.

List of forms used by the Car Service Agent.

C. S. 1. The local freight car record.

C. S. 2. Foreign freight car record.

C. S. 3. Conductor's report of freight train.

C. S. 4. Report of interchange of freight cars with other lines.

C. S. 5. Postal card notice to owner of cars of cars delivered by a foreign line to another foreign company.

C. S. 6. Tracer for delayed freight cars.

C. S. 7. Daily report of freight cars on hand.

C. S. 8. Agent's order for freight cars.

C. S. 9. Foreign car order.

C. S. 10. Telegraph notice to agents.

C. S. 11. Telegraph order directing movement of freight cars.

C. S. 12. Notice of errors and omissions.

C. S. 13. Telegraph empty car report.

C. S. 14. Superintendent's telegraph report of foreign freight cars on hand for which there is no use.

C. S. 15. Superintendent's daily telegraph report of freight cars wanted and available.

C. S. 16. Record of orders received by car service agent for freight cars.

C. S. 17. Agent's telegraph report of time freight forwarded.

C. S. 18. Agent's telegraph report of time freight enroute.

C. S. 19. Conductor's telegraph report of time freight left (delayed) enroute.

C. S. 20. Agent's telegraph report of delayed time freight forwarded.

C. S. 21. List of freight cars.

LOCAL FREIGHT CAR RECORD.

(¼ of the page.)

Movements of Cars from _____ 19___ to _____ 19___

(Illustration: Cars Nos. 7100 to 7198.)

Last Record brought forw'd	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
00																																00
02															43																	02
04																																04
06																																06
08																																08
10																																10
12																																12
14																																14
16																																16
18																																18
20																																20
22																																22
24																																24
26																																26
28																																28
30																																30
32																																32
34																																34
36																																36
38																																38
40																																40
42																																42
44																																44
46																																46
48																																48
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	

FOREIGN FREIGHT CAR RECORD.

Record of Movements of _____ R. R. Freight Cars During Month of _____ 19__

Cars Received				Last Record Brought Forw.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Car No's	Rec. from R.R.	At Sta.	DATE	At Sta.	DATE																															
4 0 7 3	I.C.	4	4 23	88	4/30										350																					
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

CONDUCTOR'S REPORT OF FREIGHT TRAIN

FREIGHT CONDUCTOR'S TRIP REPORT. *Train No.*_____ *Date*_____ *19*____

*Ordered to leave at*_____ *M. Left*_____ *at*_____ *M. Arrived at*_____ *Station at*_____ *M.*

*Conductor*_____ *Brakeman*_____

	CLAIMED.		ALLOWED	
	Through	Way-Freight	Through	Way-Freight
Scheduled Mileage,				
Overtime,				
Delayed Time,				
Switching at Terminals,				
Total Mileage for Day's Work,				

*Miles run*_____

REMARKS.

The numbers and initials of cars must be taken from the cars and not from way-bills.

	INITIALS	CAR NUMBERS		OFFICE CHECK COLUMN	BILLED FROM	BILLED TO	WHERE TAKEN	WHERE LEFT	CONTENTS	CAR MILE-AGE	Weight of car & contents in tons	This column is to be left blank.
		Loaded	Empty									TON MILES.
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												

REPORT OF INTERCHANGE OF FREIGHT CARS WITH OTHER LINES.

_____ Station, No. _____

DAILY INTERCHANGE REPORT OF CARS DELIVERED TO _____ R _____

X Loaded.
— Empty. From _____ M., to _____ M., _____ 19__

INITIALS 1	Kind of Cars. 2	NUMBER 3	X 4	Check	POINT OF SHIPMENT 5	FINAL DESTINATION 6	CONTENTS 7	Hour Delivered 8
				1				
				2				
				3				
				4				
				5				
				6				
				7				
				8				
				9				
				10				
				11				
				12				
				13				
				14				
				15				
				16				
				17				
				18				
				19				
				20				
				21				
				22				
				23				
				24				
				25				
				26				
				27				
				28				
				29				
				30				
				31				
				32				
				33				
				34				
				35				
				36				
				37				
				38				
				39				
				40				
				41				
				42				
				43				
				44				
				45				
				46				
				47				
				48				
				49				
				50				

I certify that these cars were received as above.

_____ Agent _____ R _____

_____ Agent.

Postal Card Notice to Owner of Car of Cars Delivered by a Foreign Line to Another Foreign Company.

JUNCTION REPORT OF CARS DELIVERED TO OUR CONNECTIONS.

On.....19..... (Printed Signature)

(Title of Officer)

X Loaded. —Empty (Address)

CAR.		X —	Delivered to (Full Initials)
Full Initials.	Number		

Note.—This form is used by foreign roads to notify owners of the delivery of their cars to still other lines. It is the source of information from which the record is compiled by the owner of whereabouts of the car on foreign lines.

TRACER FOR DELAYED FREIGHT CARS.

OFFICE CAR SERVICE AGENT.

_____ *19*____

_____

*Agent,*_____

Dear Sir:

*According to my record*_____

*car No.*_____

_____

*arrived at your station on*_____

since which time it has not moved.

Please note hereon disposition made of this car and return this letter by first train.

_____

Car Service Agent.

To the Car Service Agent,

Dear Sir:

Below find disposition of equipment specified above.

_____

_____

_____

_____

(*If car has been forwarded, give date, train and destination.*)

_____

Agent.

NOTE.—The above is a printed form of letter of inquiry which is sent to station agents to secure disposition of freight cars the movement of which seems to be unduly detained. This blank is also used to secure information regarding disposition of cars that have been delivered to connecting lines and not reported; also of cars moved by conductors and not reported. Through its use car service officer traces and secures movement of delayed cars.

DAILY REPORT OF FREIGHT CARS ON HAND.

At _____ Station, 3 o'clock P. M. of _____ 19____

_____ Agent.

	Whose Car.	No. of Loaded Car.	No. of Empty Car.	Description of Car.	Date of Way-Bill.	Date Arrived.	Date Placed for Unloading.	NO. OF DAYS DETAINED. Unloading.	Empty.	Loading.	CONTENTS.	CONSIGNEE.	Is Car Service Being Collected?	REASON OF DELAY.
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														

AGENT'S ORDER FOR FREIGHT CARS.

RECEIVED FROM	TIME RECEIVED	SENT BY	RECEIVED BY
.....	.....	.....	.....

From.....Station .....19..

To CAR SERVICE AGENT .....

A. Order No..... Time filed.....M.

B. Number of cars wanted.....

C. Initials.....

D. Class of cars wanted.....

E. Size of cars wanted.....

F. Where wanted .....

G. To be loaded with.....

H. Destination of load.....

I. Routing in full including point car leaves our rails .....

J. Latest date cars can be used .....

K. Remarks: .....

.....

.....

.....

.....

.....

.....

.....

NOTE.—This car order blank is used by agents to place orders for freight cars for a specific purpose and is so arranged as to enable them to specify the kind of cars needed; destination of load; kind of freight to be loaded; the routing, if it leaves the rails of home line; date on which the car must be ready for loading, and so on, There is also a space provided for any special instructions that the agent may wish to give in placing the order. If the order is sent by telegraph only the letters are indicated therein: as, say, "B" would be understood to mean "Number of cars wanted," etc.

The blank spaces at top are filled up by the telegraph operator.

FOREIGN CAR ORDER.

OFFICE OF CAR SERVICE AGENT.

_____ 19__

_____

_____

Order No._____.

Deliver us _____

Carded _____

_____

_____

To load with _____

Destination _____

Route _____

_____

_____
Car Service Agent.

NOTE.—This blank is used by the car service agent as a requisition on other companies for freight cars to load via their lines; that is if he is unable to pick up the foreign equipment he requires, on his own road.

TELEGRAPH NOTICE TO AGENTS OF FREIGHT CARS BILLED TO THEM.

_____

_____ 19____

To_____.

_____

We have billed to (A)_____ on

order number (B)_____ the following cars_____

_____

_____

_____

_____

Car Service Agent.

NOTE.—The above blank is used by the car service agent in notifying agents of freight cars billed to them to apply on their orders. They are thus kept advised as to progress made in filling their requisitions and advised on what orders the cars are to be applied when received. The car service agent in telegraphing uses only the letter "A," which the recipient understands to read "We have billed to you"; similarly, "B" means "On order number."

TELEGRAPH ORDER DIRECTING MOVEMENT OF FREIGHT CARS.

OFFICE OF THE CAR SERVICE AGENT.

_____ 19____

_____

_____

ORDER No._____

BILL TO_____

_____

_____

NOTICE OF ERRORS AND OMISSIONS.

OFFICE CAR SERVICE AGENT.

_____ 19____

_____

_____

DEAR SIR:

On your Car Report Form_____

Date_____ 19____

your report _____

_____

_____

It should be_____

_____

_____

You will please make correction as indicated above and return this with your reply without delay.

Yours respectfully,

_____

Car Service Agent.

NOTE.—The above is form of advice used by the car service agent to notify conductors and agents of errors in their reports. By this means conductors and agents correct errors in their respective records, so that if information is asked of them subsequently they will be able to answer correctly.

TELEGRAPH EMPTY CAR REPORT.

From Station_____ For month of_____ 19___

"V" SHORTAGE OF EMPTY CARS.—Make an intelligent estimate of cars required in excess of the cars available within the next twenty-four hours, either for local loading or for delivery to connecting lines, by taking into account the empties on hand, loaded cars which are likely to become available by unloading, the probable receipts of empties from connecting lines within the next twenty-four hours; also, the general condition of business, and report as shortage only such cars as it is necessary to forward from other points

"W" SURPLUS EMPTY CARS.—Include such empty cars as are on hand at the time of the report which can be spared without interfering with business during the next twenty four hours. Do not include slip billed cars awaiting transit. Give initials of foreign cars and home routes Junction stations will not include switched cars to be returned to connecting lines, nor foreign cars awaiting delivery to home lines which, therefore, are not available for loading.

"X" EMPTY CARS ON HAND WANTED.—Do not include cars in process of loading, nor empty cars which will not be required within twenty-four hours.

"Y" CARS ACTUALLY UNLOADING.—Large stations will only report the number for each column, other stations will report in detail, giving initials of foreign cars. Junction stations will not include switched cars to be returned to connecting lines when empty, nor other foreign cars which will be delivered to home or connecting lines when empty, and which, therefore, will not be available for loading via this road.

DATE	FURNITURE A				BOX 36 FT. AND OVER C				BOX UNDER 36 FT. D				PALACE STOCK G				SINGLE DECK STOCK H				DBL DECK STOCK J				FLAT K				GONDOLA M				REFRIGRTR N				MISCEL. Tank, Poul. Etc. Q				TIME SENT
	Shortage V	Surplus Empty Cars W	On hand Wanted X	Actually Unloading Y	Shortage V	Surplus Empty Cars W	On hand Wanted X	Actually Unloading Y	Shortage V	Surplus Empty Cars W	On hand Wanted X	Actually Unloading Y	Shortage V	Surplus Empty Cars W	On hand Wanted X	Actually Unloading Y	Shortage V	Surplus Empty Cars W	On hand Wanted X	Actually Unloading Y	Shortage V	Surplus Empty Cars W	On hand Wanted X	Actually Unloading Y	Shortage V	Surplus Empty Cars W	On hand Wanted X	Actually Unloading Y	Shortage V	Surplus Empty Cars W	On hand Wanted X	Actually Unloading Y	Shortage V	Surplus Empty Cars W	On hand Wanted X	Actually Unloading Y	Shortage V	Surplus Empty Cars W	On hand Wanted X	Actually Unloading Y	

INSTRUCTIONS.—This report must be made in detail each day and transmitted by telegraph to the Chief Dispatcher at the designated time. At the end of each month it must be filed so that it can be produced at any time.

SUPERINTENDENT'S TELEGRAPH REPORT OF FOREIGN FREIGHT CARS ON HAND FOR WHICH THERE IS NO USE.

To Car Service Agent: _____ 19____

Foreign Freight Cars on hand Empty at 6 P. M.

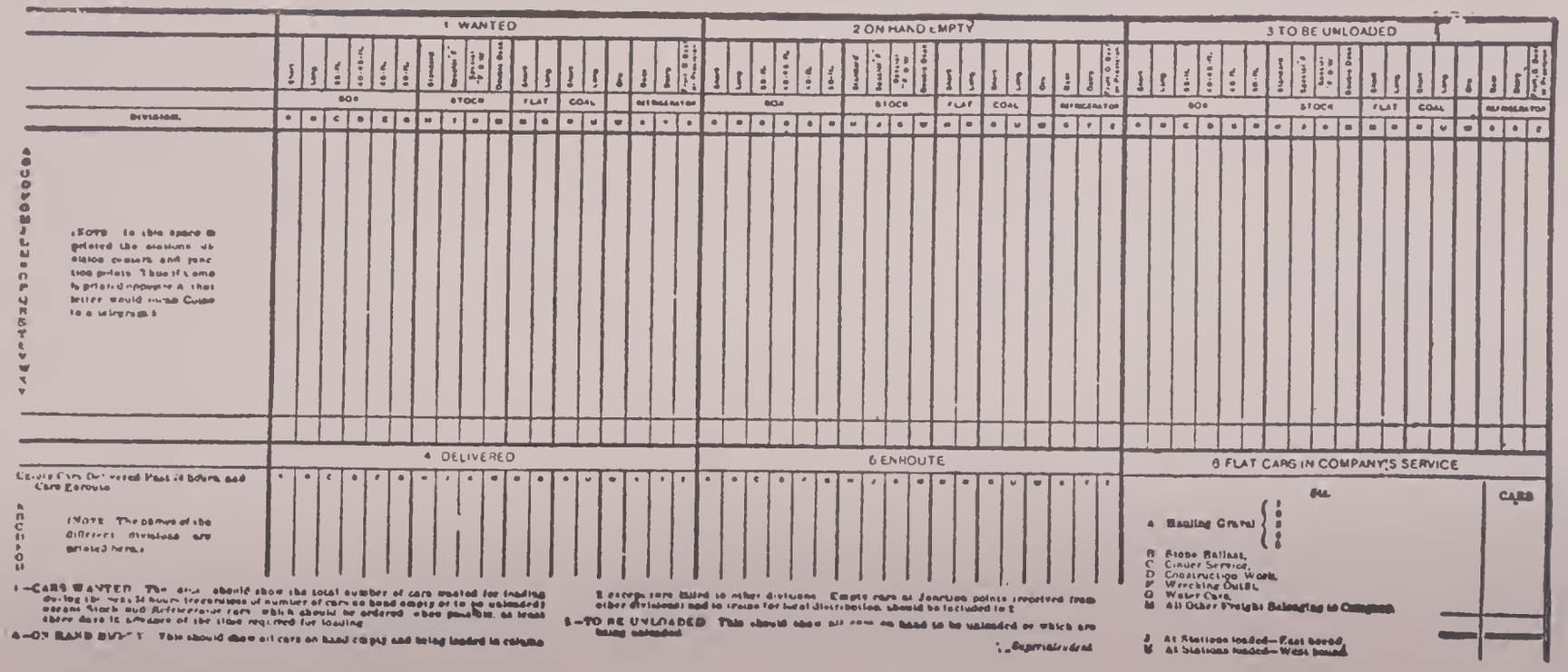
	LOCATION A	INITIALS B	CAR NO.	Kind C	Len. Feet D	ORIGINAL RECEIPT H		Date	DISPOSITION J
						Road	Point		
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									

This report should also include cars stored or held for prospective business.
One car number only should be inserted on each line.
When necessary to use second sheet commence it (in first column) with No. 28.
Columns H and J should not be filled up.

Signature _____

SUPERINTENDENT'S DAILY TELEGRAPH CAR REPORT OF FREIGHT CARS WANTED AND AVAILABLE.

To Car Service Agent. **7:30 A. M._____ 19__**



RECORD OF ORDERS RECEIVED BY CAR SERVICE AGENT FOR FREIGHT CARS.

DATE		ORDER NO.		WHERE WANTED	No. of Cars Wanted	DESCRIPTION			DESTINATION	ROUTING	Date Wanted	Ordered From	CARS FURNISHED
Month	Day	Car Ser. Agts No.	Train Des. No			Class	Length	Capacity					

AGENT'S TELEGRAPH REPORT OF TIME FREIGHT FORWARDED.

15 REPORT

Station_____ Date_____ 19__

The following cars of TIME FREIGHT left this station on Train No. _____ at _____ M.

Code Letter and Number	CAR		CONTENTS	DESTINATION	* If final destination is to point beyond our line, give		Station	Time Left	Train	Date	Station	Time Left	Train	Date	Delivery to Connecting Line			
	Initials	No.			Junction point where it leaves our line	Routing beyond									Time Arr.	Time Del.	Date	Name of Line
A	B	C	D	F	G	H												

(a) _____ Agent.

(b) _____ Yardmaster.

This should be sent to car service agent by telegraph immediately after departure of cars.

NOTE.—This form is used by agents to notify the car service agent of the forwarding of "Time Freight." The various columns provide for code letter and number assigned to the station, car initials, number, etc.

Thus "A" is the code letter signifying the station, "B" initials of the car, "C" number of car, and so on. In this respect it is the only report in which the initials, number, contents and destination of cars are given; in other reports of the movements of cars (after forwarding) they are designated entirely by code-letter and code number.

AGENT'S TELEGRAPH REPORT OF TIME FREIGHT EN-ROUTE.

Station_____ Date_____ 19___

The following cars, Way-billed TIME FREIGHT, passed this Station (or were delivered Connecting Line) on date and time given below:

CODE LETTER AND NUMBERS			TIME ARRIVED	TIME LEFT or Delivered Connecting Line	TRAIN NUMBER
Code Letter	From Lowest Number	To Highest Number			
B	C	D	F	G	H
			M	M	
			M	M	
			M	M	
			M	M	
			M	M	
			M	M	
			M	M	
			M	M	
			M	M	
			M	M	

(A)_____Yardmaster.

(B)_____Agent.

NOTE.—This report is sent by telegraph to the car service agent, immediately after arrival and departure of cars. The form is used for reporting by telegraph the passing of time freight by agents at freight terminals. The code letter; code number; arriving time; time of departure and number of train is all that is required.

CONDUCTOR'S TELEGRAPH REPORT OF TIME FREIGHT LEFT (DELAYED) ENROUTE.

The following cars, way-billed TIME FREIGHT, were set out (left) at

Station_____

Date_____ 19___

CODE LETTER AND NUMBERS			By Train No.	REASON (Give exact cause for leaving car)
Code Letter	From Lowest No	To Highest No.		
B	C	D	F	G

_____ Conductor.

Train No._____

NOTE.—This report is made promptly and handed to the operator at the nearest telegraph station, who should send it at once to the car service agent, a copy being sent to the chief train dispatcher of the district on which cars were left. It is used by conductors to report to the car service agent time freight left short of destination. It is telegraphed in the condensed form shown, nothing being transmitted except code letter and code number, number of train setting out car and reason therefor.

AGENT'S TELEGRAPH REPORT OF DELAYED TIME FREIGHT FORWARDED.

The following cars, Way-billed TIME FREIGHT, which have been delayed, were forwarded from_____Station _____19___

CODE LETTER AND NUMBERS			TIME FORWARDED	TRAIN NUMBER
Code Letter	From Lowest Number	To Highest Number		
B	C	D	F	G
			M	
			M	
			M	
			M	
			M	
			M	
			M	
			M	
			M	
			M	
			M	

(A)_____Yardmaster

(B)_____Agent

NOTE.—This form is used by agents and yardmasters to advise the car service agent by telegraph of the forwarding of delayed cars loaded with time freight; only the code letter, code number, time of forwarding, and number of train in which forwarded is transmitted. The report aids the car service agent in his supervision over time freight.

DEMURRAGE AND STORAGE SERVICE—FORMS USED.

LIST OF FORMS.

D. S. 1. Station record of cars subject to car service.

D. S. 2. Agent's daily report of cars received, ordered, placed and released.

D. S. 3. Notice to agent of errors and omissions in daily car service report.

D. S. 4. Headquarters record of car service.

D. S. 5. Agent's weekly statement of car service charges collected.

D. S. 6. Agent's monthly statement of uncollected car service charges.

D. S. 7. Monthly statement for the railroad company of car service charges against its agents.

D. S. 8. Authority (in duplicate) to agent to make refunds of car service charges.

D. S. 9. Authority to cancel car service charges.

D. S. 10. Agent's daily report of charges made for storage of freight.

D. S. 11. Agent's weekly statement of storage charges collected.

D. S. 12. Agent's monthly statement of uncollected storage charges.

D. S. 13. Monthly statement for the railroad company of storage charges against its agents.

STATION RECORD OF CARS SUBJECT TO CAR SERVICE.

NOTE.—This book is used by agent for purpose of recording the movement of cars at stations, subject to Car Service rules. It is written up from day to day as the service progresses.

CAR		CAR RECEIVED			CAR ORDERED		CAR PLACED		CAR RELEASED		Car Service Charge	Location of Car	Contents of Car	Consignee or Consignor
No.	Initial	From	Date	Time	Date	Time	Date	Time	Date	Time				

AGENT'S DAILY REPORT OF CARS RECEIVED. ORDERED. PLACED AND RELEASED.

To_____ _____Station _____R. R.

_____

_____

Dear Sir: Below please find statement for the 24 hours ending 6 P. M.,_____19___

_____Agent.

_____

NOTE.—This report must be made daily (except Sundays). Monday's return will include Sunday's business. It must be forwarded in time to reach the proper official not later than 48 hours after the period for which it is made.

Empty cars placed for loading should be designated in the 'Received' column thus: "X." In reporting cars released agent must furnish complete record of each car, date and time received, date and time ordered, date and time placed, with contents, consignees and amount of car service.

There shauld be no charge made for the days cars are detained by railroad company.

CAR		RECEIVED			ORDERED		Detention by R.R. Co.	PLACED		RELEASED		Public or Private Track	Contents	CONSIGNEE OR CONSIGNOR	Car Serv. Charge
Number	Initial	From	Date	Time	Date	Time		Date	Time	Date	Time				

NOTICE TO AGENT OF ERRORS AND OMISSIONS IN HIS DAILY CAR SERVICE REPORT.

_____ 19__

To _____ Agent, _____ Railroad Co.

At _____ Station.

On receipt of this form, the agent will sign his name thereto and return the original to the maker (retaining the duplicate for file) provided charges as corrected are in accordance with the record. If not correct, the original and duplicate should be returned with explanation.

_____

_____

YOUR DAILY CAR SERVICE REPORT FOR CARS RELEASED 6 P. M. _____ 19__ reads as follows:

CAR No.	CAR Initial	RECEIVED	ORDERED	PLACED	RELEASD	Car Ser. Charge	CONTNTS	CONSIGNEE

IN CONFORMITY WITH THE CAR RECORD, THE CHARGE AGAINST YOUR STATION HAS BEEN CHANGED TO READ AS FOLLOWS:

HEADQUARTERS RECORD OF CAR SERVICE FOR STATION NAMED.

For _____ R. R. _____ Station. _____ Agent. _____ 19___

CAR		RECEIVED		ORDERED		PLACED		REL'SD		Con-tents	Con-signee	DEBITS	CREDITS			Car Serv. Refunds	CLAIM	
Number	Initial	Date	T'm	Date	T'm	Date	T'm	Date	T'm			Car Ser. Charge	Car Ser. Collected.	Car Ser. Cancelled.	Date		No.	Date

AGENT'S WEEKLY STATEMENT OF CAR SERVICE CHARGES COLLECTED.

_____Station, _____19___

To_____

_____

Dear Sir.

The following is a statement of car service charges collected by me for the week ending_____19___ for_____R. R. Co.

_____Agent.

Collections should not be included until final release of car.

NOTE.—This return is necessary in writing up record form 4 at Headquarters.

CAR NUMBER	INITIAL	DATE RELEASED	AMOUNT COLLECTED	FROM WHOM COLLECTED

AGENT'S MONTHLY STATEMENT OF UNCOLLECTED CAR SERVICE CHARGES.

To_____ _____ 19__

_____

Dear Sir:—

Below please find statement of all uncollected car service charges due_____ R. R. Co.

at_____ Station, for the month of_____ 19__

_____

Agent.

(NOTE.—This report must be made immediately after close of month.)

_____

Station.

CAR NO.	INITIAL	WHEN RECEIVED		WHEN PLACED		WHEN RELEASED		AMOUNT OF CAR SERVICE CHARGE	FROM WHOM DUE	WHY NOT COLLECTED
		Date	Hour	Date	Hour	Date	Hour			

MONTHLY STATEMENT TO THE RAILROAD COMPANY OF CAR SERVICE CHARGES CHARGEABLE AGAINST ITS AGENT.

To _____ _____ 19___
Accounting officer of
_____ R. R. Co.

Dear Sir:—

The following is a statement of CAR SERVICE CHARGES at _____ Station, for month of _____ 19___, which please charge to _____ Agent.

(NOTE.—One copy of this is sent to the accounting officer of the road; one copy to the agent interested; one copy is filed in the office (by the official in charge) where the statement is compiled).

CAR NO.	INITIAL	DATE RELS'D	CAR SERVICE	CAR NO.	INITIAL	DATE RELS'D	CAR SERVICE

AUTHORITY (IN DUPLICATE) FOR AGENT TO REFUND CAR SERVICE CHARGES.

ORIGINAL

_____ 19__

To_____

Agent_____R R. Co. Claim No._____

_____Station.

DEAR SIR:—

You will please refund to_____ the following amounts collected by you account of car service on cars enumerated below. Please be particular to take receipt in duplicate (on forms herewith), allowing no alteration or erasure to be made thereon. When settlement has been effected, send original receipt to the accounting officer of your company and the duplicate to this office, together with all papers connected with the claim.

_____

_____

CAR		CAR SERVICE	
Number	Initial	Amount Collected	Amount to be Refunded

RECEIPT.

_____Station_____19__

Received of_____Agent, the sum of

_____Dollars, ($_____)

in payment of amount referred to in the above statement, and in full settlement of claims for the cars mentioned.

_____

AUTHORITY TO CANCEL CAR SERVICE CHARGES.

_____ 19___

To_____ Agent. Claim No._____

of_____ R. R. Co._____ Station.

Dear Sir:

You are hereby authorized and directed to cancel car service charges assessed against the following cars account of

_____

NOTE.—You will send this sheet to the accounting officer of your company as your authority for canceling the charges enumerated below.

Yours truly

_____

_____

Car Number	Initials	Amount Assessed	Amount to be cancel'd	Date Released	REMARKS

.....

Claim No._____

_____ R. R._____ Station._____ 19___

To_____

_____

Dear Sir: In accordance with the authority contained in your order of _____ 19___, I have this day canceled $_____ car service charges mentioned therein, and herewith return to you all papers connected with the claim.

_____ Agent.

NOTE.—Agent will fill up this form and detach and forward as indicated.

AGENT'S DAILY REPORT OF CHARGES ASSESSED FOR STORAGE OF FREIGHT.

To_____ Sheet No._____

_____ _____Station,_____Railroad.

Dear Sir—Below please find statement of charges assessed for storage of shipments forwarded and delivered during 24 honrs ending _____19___ _____19___. _____Agent.

[NOTE.—All shipments delivered or forwarded on which storage charges have accrued must be reported on this form. The report must be made daily (Sundays and holidays excepted as provided by the rules) and forwarded promptly to the official in charge. Shipments delivered on Sundays and holidays will be included in report for previous day. Agents will use only columns 2 to 9, inclusive (headed "Station Record"). In reporting freight delivered, date unloaded and date delivered will be shown in columns 5 and 6; for freight forwarded, date freight is received and also date final billing directions are received will be entered in columns 5 and 6. For reporting shipments forwarded, the way-bill number should be entered in "Pro." column 4, designating such freight by letters "O. F." in column 1. Letters "C. L." should be inserted in column 15 when carload freight is reported. Supplementary reports for all shipments omitted from regular reports should be made. The records as shown on this report will be checked at headquarters by the official in charge of Car Service matters. If charges are not in accordance with the rules, agents will receive notice of correction. A copy of this report should be kept on file in the office of agent making the same. Sheets must be numbered consecutively, beginning with No. 1, the first of each month.]

STATION RECORD									HEADQUARTERS RECORD					
1	2		3	4	5	6	7	8	9	10	11	12	13	14	15
	CAR		Storage Pro.	R.R. Pro.	Date Unloaded or Received for Shipment	Date Del. or Receipt of Forwarding Instructions	CONSIGNEE OR CONSIGNOR	WEIGHT	Storage Charge	Collections	Date	CLAIM			Car Load
	No.	Initial										Relief	Refund	Number	

AGENT'S WEEKLY STATEMENT OF STORAGE CHARGES COLLECTED.

To_____, _____ 19__

Dear Sir:
Below please find report of storage charges collected at _____ Station,

_____ Railroad, for week ending _____ 19__

(NOTE.—This report must be closed at 6 P M. on the 7th, 14th, 21st and last day of each month, and forwarded by agent promptly to the official in charge at Headquarters.)

_____ Agent.

_____ Station.

CAR NUMBER	INITIAL	RAILROAD PRO.	CAR SERVICE PRO.	DATE FREIGHT DELIVERED OR FORWARDED	AMOUNT COLLECTED	FROM WHOM COLLECTED

AGENT'S MONTHLY STATEMENT OF UNCOLLECTED STORAGE CHARGES.

_____ Station _____ 19____

To _____

_____

Dear Sir:—Below please find statement of all uncollected storage charges due _____

R. R. Co. at _____ Station on the last day of _____ 19____.

(NOTE.—This report must include all unpaid storage charges whether same have been previously reported or not. It must be forwarded promptly at the close of each month to the official in charge).

_____ Agent.

CAR NUMBER	INITIAL	RAILROAD PRO.	CAR SERVICE PRO.	DATE FREIGHT DELIVERED OR FORWARDED	AMOUNT DUE	FROM WHOM DUE	WHY NOT COLLECTED

MONTHLY STATEMENT TO THE RAILROAD COMPANY OF STORAGE CHARGES CHARGEABLE TO ITS AGENT.

To_____ _____ 19___

Accounting Officer of the_____ R. R. Co.

DEAR SIR:

The following is Statement of STORAGE CHARGES at_____ Station which please charge to_____ Agent of_____ R. R. Co. for month of_____ 19___

W-B. or PRO. NUMBER	WEIGHT	DATE RELEASED	AMOUNT CHARGED	W-B. or PRO. NUMBER	WEIGHT	DATE RELEASED	AMOUNT CHARGED

NOTE.—This return is made in triplicate by the official in charge of storage matters: one copy he retains; one copy he sends to the agent interested; the other copy he sends to the accounting officer of the railroad company so that the amount may be audited and charged to the agent.

CAR ACCOUNTING FORMS.

The forms used by the "Auditor of Car Accounts" here shown are merely illustrative. They do not comprise the entire number used. Indeed the number and style of forms vary on different roads according to their respective requirements.

1. Interchange slip.
2. Report of interchange—other lines.
3. Missing record report.
4. Monthly summary—Per D and other credits.
5. Penalty notice.
6. Comparative statement.
7. Statement to owner.
8. Division superintendent's advice.
9. Conductor's report.
10. Monthly statement freight train service, etc.
11. Monthly statement passenger train service, etc.

INTERCHANGE SLIP (RECORD) OF CARS DELIVERED BY

_____ R. R.

To _____ R____

At _____ M. Engine No. _____
(Give hour, A. M. or P. M.)

_____
(Name of employe in charge of delivery.)

_____ Station

_____ 19____

X Loaded. — Empty.

This form and a carbon copy thereof is to be filled up for each "cut" of cars delivered to a connecting road. (By "Cut" is meant cars taken from one freight yard to another by an engine without a train conductor.) Deliveries to different lines must not be included on the same slip. This form is to be filled up and a copy made before leaving the yards of this Company. It must be signed by the proper representative, leaving vacant the time of delivery, which will be filled in on reaching the delivery tracks of the connecting road. The signatures of the representative authorized to sign for that road must be obtained. One copy of this slip will be left with the connecting road and the other returned to the agent of the delivering road.

This report should show whether cars are loaded or Empty, X being used for loaded and — for empty cars.

These slips must be preserved for production as evidence if accuracy should be subsequently disputed.

INITIALS	KIND OF CAR	NUMBER	X	CHECK
				1
				2
				3
				4
				5
				6
				7
				8
				9
				10
				11
				12
				13
				14
				15
				16
				17
				18
				19
				20
				21
				22
				23
				24
				25

Certified correct:

_____ R_____

Certified correct:

_____ R_____

REPORT OF INTERCHANGE OF FREIGHT CARS WITH OTHER LINES.

_____Station, No._____

DAILY INTERCHANGE REPORT OF CARS DELIVERED TO_____R_____

X Loaded.
— Empty. From_____M., to_____M.,_____19__

INITIALS 1	Kind of Cars. 2	NUMBER 3	X 4	Check	POINT OF SHIPMENT 5	FINAL DESTINATION 6	CONTENTS 7	Hour Delivered 8
				1				
				2				
				3				
				4				
				5				
				6				
				7				
				8				
				9				
				10				
				11				
				12				
				13				
				14				
				15				
				16				
				17				
				18				
				19				
				20				
				21				
				22				
				23				
				24				
				25				
				26				
				27				
				28				
				29				
				30				
				31				
				32				
				33				
				34				
				35				
				36				
				37				
				38				
				39				
				40				
				41				
				42				
				43				
				44				
				45				
				46				
				47				
				48				
				49				
				50				

I certify that these cars were received as above.

_____Agent_____R_____

_____Agent.

MISSING RECORD REPORT. OWNER'S REQUEST UPON OTHER COMPANIES FOR MISSING RECORD OF ITS CARS.

(Address and Date) 19___

Mr. _____

_____

_____

The cars described below delivered your line show later movements but we have no junction report showing delivery to your connections. Please supply the missing record and return sheet to me.

(Signature) _____

(Title of Officer) _____

INITIALS	NUMBER	DEL. YOUR LINE		MISSING RECORD		NEXT REPORT		
		BY	DATE	DELIVERED TO	DATE	DELIVERED BY	TO	DATE

NOTE.—This form, as explained, is used by the owner of cars to obtain necessary information from foreign companies. Thus, if a company in possession of a car should fail to show its delivery to a connecting road, or in fact should fail to show the proper disposition of the car, this blank is used to obtain information necessary to correct the omission. The correction should be made on this form by the company in error, after which it should be returned to the sender.

MONTHLY SUMMARY OF PER DIEM AND OTHER CREDITS FOR USE OF FREIGHT AND OTHER CARS.

For cars of _____ R___., Month of _____ 19___

NOTE.—This form is used by the company using the cars to report to the owners the total amount due them when the number of cars requires the use of more than one sheet of form C. A. 7. This form is, however, used in all cases where there is a credit for baggage, passenger, or other than freight cars, as summarized at the bottom.

Sheet	DAYS		PER DIEM SUMMARY			AMOUNT
	Per diem	Penalty				
			Per diem		Days @ — c.	
			Penalty		Days @ — c.	
			RECLAIMS			
			Your Ref. No.	Our Ref. No.	Amount	
					TOTAL RECLAIMS	
					TOTAL PER DIEM	
			MILEAGE		AMOUNT	
			Baggage Cars	Miles @ — c		
			Passenger Cars	, @ — c.		
			Cars	, @		
					TOTAL MILEAGE	
TOTAL					GRAND TOTAL	

_____ (Address and Date) _____ 19___

_____ (Signature)

_____ (Title of Officer)

PENALTY NOTICE. OWNER'S NOTICE TO CONNECTING ROAD OF PENALTY TO BE CHARGED FOR FAILURE TO RETURN ITS CARS.

_____ 19____

Mr._____

_____

_____

The cars of this company, enumerated below, have been on your line_____ consecutive days and you are hereby notified that unless same are disposed of within _____days from this date, a penalty of_____cents per car per day, in addition to the regular per diem rate, will be charged for such cars. Please retain the original of this and return the copy.

_____

_____

Check	CAR			DELIVERED		REPLY		
	INITIALS	KIND	NUMBER	BY OR AT	DATE	LOCATION	DISPOSITION	DATE
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								

This notice must be printed in bright red ink. (Such are the specific regulations.) It must be mailed in duplicate. The original will be retained by the receiving road and the duplicate returned as an acknowledgment, and bearing notations showing disposition made of cars which may have cleared the line of the receiving road. No form of penalty notice must be used, differing in size or style from this. This notice must be mailed in an envelope bearing the full and complete address (name, title, road, town and state) of the officer to whom sent. Preferably it should be sent by U. S. mail only, although in the case of immediate and direct connections, it may be forwarded by railway service.

PENALIZING A COMPANY. In order to penalize a company having cars in its possession (i. e., enforce a penalty for the detention of cars), the owner must demand the return of his car after it has been a stipulated number of days (say twenty) consecutively, on a road. If the car is held by such road more than a given number of days (say ten) after the date of such demand (given on the prescribed form) the penalty charge agreed upon for each day of detention thereafter, is enforced in addition to the usual per diem rate.

OFFICE OF AUDITOR CAR ACCOUNTS.

COMPARATIVE STATEMENT OF PASSENGER AND FREIGHT TRAIN AND CAR MOVEMENT.

For the month of_____ 19___

PASSENGER	YEAR		PERCENTAGE	
	19....	19....	Increase	Decrease
Total number of trains run,				
Average number of trains run per day,				
Total number of miles run by trains,				
Average number of miles run by each train,				
Total number of miles run by passenger, baggage, mail and express cars,				
Number of passenger cars hauled,				
Number of baggage, mail and express cars hauled,				
Total number of cars hauled,				
Average number of passenger, baggage, mail and express cars hauled in each train				
FREIGHT				
Number of trains run,				
Average number of trains run per day,				
Total number of miles run by trains,				
Average number of miles run by each train,				
Total number of miles run by loaded cars,				
Total nnmber of miles run by empty cars,				
Total number of miles run by all cars,				
Number of loaded cars hauled west bound,				
Number of empty cars hauled west bound,				
Number of loaded cars hauled east-bound,				
Number of empty cars hauled east bound,				
Total number of loaded cars hauled,				
Total number of empty cars hauled,				
Total number of cars hauled,				
Average number of cars hauled in each train per mile run,				

STATEMENT TO OWNER OF THE NUMBER OF MILES RUN BY ITS PASSENGER EQUIPMENT ON THE LINE OF A FOREIGN ROAD.

OFFICE OF AUDITOR CAR ACCOUNTS.

To _____

Dear Sir: Herewith please find report of mileage of _____ railroad passenger cars on _____ Railway, during the month of _____ 19____

_____

Auditor Car Accounts.

KIND OF CAR																		
NUMBER																		
DATE	Miles	Miles	Miles	Miles	Miles	Miles	Miles	Miles	Miles	Miles	Miles	Miles	Miles	Miles	Miles	Miles	Miles	Miles
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																		
17																		
18																		
19																		
20																		
21																		
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		
31																		

NOTE:—This form is used in notifying owners of passenger cars of the number of miles run by each individual car while on the line of another road. This information is required because the terms of purchase of passenger car wheels and the guarantee thereof, is in many cases based upon the number of miles run, and in no way, save this, can such information be obtained while cars are on other roads.

DIVISION SUPERINTENDENT'S ADVICE OF TRAINS MOVED.

TO THE AUDITOR, CAR ACCOUNTS. TO THE TICKET AUDITOR.	OFFICE OF SUPERINTENDENT. _____ Division. Office at _____ Date _____ 19___

Dear Sir;

Below find list of trains moved on this Division on _____ 19___

_____ Division Sup't.

No. of Train.	Name of Conductor in Charge.	Where Train Was Taken From.	Where Train Was Left.

NOTE.—This is a form on which the division superintendent reports to the auditor of car accounts a list of trains moved on his division each day. It is used to determine if conductors' reports of trains have been received for every train run on the division.

It is made in duplicate, one copy being forwarded to the ticket auditor by whom it is used in checking conductors' ticket returns and cash fare reports.

CONDUCTOR'S REPORT OF FREIGHT TRAIN.

FREIGHT CONDUCTOR'S TRIP REPORT. *Train No.*____ *Date*____ *19*____

*Ordered to leave at*____ *M. Left*____ *at*____ *M. Arrived at*____ *Station at*____ *M.*

*Conductor*____ *Brakeman*____

	CLAIMED.		ALLOWED	
	Through	Way-Freight	Through	Way-Freight
Scheduled Mileage,				
Overtime,				
Delayed Time,				
Switching at Terminals,				
Total Mileage for Day's Work,				

*Miles run*____

REMARKS.

The numbers and initials of cars must be taken from the cars and not from way-bills.

	INITIALS	CAR NUMBERS		OFFICE CHECK COLUMN	BILLED FROM	BILLED TO	WHERE TAKEN	WHERE LEFT	CONTENTS	CAR MILE-AGE	Weight of car & contents in tons	This column is to be left blank. TON MILES.
		Loaded	Empty									
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												

_____ Railway.

OFFICE OF AUDITOR CAR ACCOUNTS.

MONTHLY STATEMENT OF FREIGHT TRAIN SERVICE AND MILEAGE OF FREIGHT CARS.

For the month of _____ 19__

Division.	Loaded Cars, Westbound						Total (Loaded and Empty) Westbound			
	(Home) Road		Foreign		TOTAL		(Home) Road		Foreign	
	No Cars	Miles	No. Cars	Miles	No. Cars	Miles	No. Cars	Miles	No. Cars	Miles
Total										

(A similar section is provided for loaded cars eastbound: Also for empty cars westbound, and for empty cars eastbound.)

Division.	Number of Freight Trains		Total Number Miles Run by Freight Trains	Construction Trains Run		Total Number Miles Run by Freight Cars (West and East)	Total Number Freight Cars Hauled	Average No. Freight Cars Hauled in Train	Total No. Miles Run by Freight and Passenger Trains	Number Miles Run by Empty Freight Engines	
	West	East		No. Cars	Miles					West	East

Average number of cars hauled in freight train, _____

Average miles run by each train, _____

The average number of cars hauled in freight trains is found by dividing total freight car mileage by total freight train mileage. The average miles run by each freight train is found by dividing total freight train mileage by number of freight trains run. The mileage of caboose cars is eliminated.

_____

Auditor Car Accounts.

_____ Railway.

OFFICE OF AUDITOR CAR ACCOUNTS.

MONTHLY STATEMENT OF PASSENGER TRAIN SERVICE AND MILEAGE OF PASSENGER TRAIN CARS.

For the month of _____ 19____

DIVISION	PASSENGER AND SLEEPING CARS, WESTBOUND						BAGGAGE AND MAIL CARS, WESTBOUND						Grand Total, Westb'd	
	(Home) Road		Foreign		Total		(Home) Road		Foreign		Total			
	No. Cars	Miles	No. Cars	Miles	No. Cars	Miles	No. Cars	Miles	No. Cars	Miles	No. Cars	Miles	No. Cars	Miles
TOTAL														

(Similar space is provided for passenger equipment eastbound.)

DIVISION	NUMBER OF PASSENGER TRAINS		Total Number Miles Run by Passenger Trains	Total Number Miles Run by Passenger Cars	Total Number Passenger Cars Hauled	Average Number Cars Hauled in Passenger Trains	EMPTY PASSENGER ENGINE MILEAGE	
	Westbound	Eastbound					Westbound	Eastbound
TOTAL								

Average number of cars hauled in passenger train _____

Average miles run by each train _____

The average number of cars hauled in passenger train is found by dividing total passenger car mileage by total passenger train mileage.

The average miles run by each passenger train is found by dividing total passenger train mileage by number passenger trains run.

_____

Auditor Car Accounts.

PER DIEM AND DEMURRAGE.

RATES GOVERNING ACCORDING TO RULING OF THE AMERICAN RAILWAY ASSOCIATION, CHICAGO CAR SERVICE ASSOCIATION.

PER DIEM.

The latest ruling of The American Railway Association provides for a per diem rate of 25c per day and a penalty of 75c per day after thirty days; with the exception of those roads indicated by a * in the Railway Equipment Register this ruling applies. The roads thus indicated have agreed upon a per diem rate of 50c with the penalty abolished.

DEMURRAGE.

Rate one dollar per day after 48 hours from first seven a. m. notice.

SPECIMEN FORMS RELATING TO HANDLING TICKETS ETC.

LIST OF FORMS.

1.—Requisition for Tickets.
2.—Invoice and Receipt for Tickets.
3.—Record of Interline Tickets.
4.—Order to Sell at Certain Rate.
5.—Advice Concerning Conventions.
6.—Receipt and Certificate.
7.—Exchanges and Government Requests.
8.—Daily Record and Monthly Summary.
9.—Earnings Report—Local Ticket Sales.
10.—Earnings Report—Interline Ticket Sales.
11.—Monthly Return—Interline Ticket Sales.
12.—Receipt for Pledged Property.
13.—Monthly Return of Excess Baggage.
14.—Record of Ditto.

REQUISITION FOR TICKETS.

_____R. R.

_____STATION,

_____189__

To_____

DEAR SIR: Please furnish this Station with Tickets as follows:

Form.	Kind of Ticket.	Destination.	Number Required.	Highest Number of ticket of this kind on hand at the ordering station.	

INVOICE OF AND RECEIPT FOR TICKETS

_____ R. R.

No._____

_____ 189____

_____ Ticket Agent,

_____ Station.

DEAR SIR:—Herewith find tickets as invoiced below. Carefully examine each ticket in order, and make sure that none are missing. Enter all tickets received on the ticket register, recording the commencing and closing numbers correctly, date and sign the receipt at the bottom of this invoice, and forward same immed ately to the ticket auditor.

_____ G. T. A.

Form.	Kind of Ticket.	Destination.	Commenc'g No.	Closing No.	No. Tickets.

_____ 189____

I have received the tickets as noted above, and find that the numbers run consecutively, and that none are missing.

_____ Agent.

Before forwarding the above receipt, the agent will take a copy thereof.

ADVICE TO AGENTS AT STATIONS WHERE CONVENTIONS AND OTHER SIMILAR MEETINGS ARE HELD TO SELL PARTIES PRESENTING CERTIFICATES OF ATTENDANCE THEREAT, RETURN TICKETS AT REDUCED RATE.

_____ R. R. CO.

GENERAL TICKET DEPARTMENT.

New York, _____ 189__

To _____ Ticket Agent,

At _____ Station.

DEAR SIR:—This is to advise you that persons attending the _____, to be held at _____, from _____ 189__ to _____ 189__, are to be returned from your station to other local stations at _____ of regular local rates (always adding enough to make the rate terminate with 0 or 5) upon presentation at your office of proper certificates of this company's issue, duly accrediting them.

Take up the certificates presented, and return them with this notice as vouchers for the tickets reported at reduced rates, with your monthly return, otherwise allowance cannot be made for reduced rates.

_____

General Ticket Agent.

_____

I have sold under the above order _____ tickets.

_____ Agent.

The instructions that accompany this order require that:

No certificates shall be honored which bear date of issue (and thus show that going tickets were purchased) more than three days prior to the date announced for commencement of meeting; that no certificates shall be honored later than three days after date announced for close of meeting, Sunday not to be accounted as a day; that the reduction for return passage shall apply to the lowest regular first class rate, whether unlimited or limited, but for going passage either first class unlimited or limited fares may be paid at the option of the purchaser; that the ticket for return passage shall be limited to a continuous passage regardless of whether the regular fare on which the reduction is based is unlimited or limited.

RECEIPT GIVEN TO PERSONS ATTENDING CONVENTIONS FOR TICKETS BOUGHT BY THEM, ALSO CERTIFICATE OF THE CONVENTION IN REGARD TO ATTENDANCE THEREAT.

_____ RAILWAY COMPANY.

(AGENT'S CERTIFICATE FOR FARE PAID.)

M_____ has this day purchased of me

_____ Tickets at $_____ fare each, from _____ to _____

form _____ number _____ via _____

Date _____ 18____. _____ Agent.

☞ AGENT WILL STAMP THIS ON BACK.

(CONVENTION CERTIFICATE.)

I hereby certify that the person named above has been in regular attendance at the _____ held at _____; and that _____ or more persons holding certificates of the standard form, properly filled out as above, have attended said meeting.

_____ Sec'y of Meeting or Society.

When reduced rates have been arranged for in advance of meeting, this certificate will be honored by proper agent, having special instructions, for continuous trip return ticket, between above named points, via same route at the agreed reduced fare, if certificate is presented within *three* (3) days after announced date of close of meeting, providing above described going ticket was purchased not more than three (3) days prior to commencement of said meeting.

Return tickets must be procured before taking the train, as otherwise full fare will be required.

Ministers or others holding reduced fare permits or commutation tickets of any kind are not entitled to the reduction.

☞ Conductors will not accept this order under any circumstances. ☜

General Ticket Agent.

THIS CERTIFICATE is void if altered, or if not presented within prescribed dates, or if not signed by the proper officer of the association or meeting, or if certificate of purchase of going ticket is not filled out, signed and stamped by agent of this company.

NOTE.—Upon this letter the passenger is given a return ticket at the rate agreed upon.

RECORD OF INTERLINE TICKETS RECEIVED BY AGENT.

Form.....					Form.....					Form.....				
Date.	Invoice No.	Com'g No.	Clos'g No.	Number Received.	Date.	Invoice No.	Com'g No.	Clos'g No.	Number Received.	Date.	Invoice No.	Com'g No.	Clos'g No.	Number Received.

RECORD OF INTERLINE TICKETS SOLD, SPOILED AND RETURNED BY AGENT.

When Reported.	Commencing No.	Closing No.	Number.		When Reported.	Commencing No.	Closing No.	Number.		When Reported.	Commencing No.	Closing No.	Number.	
			Sold.	Spoiled and Returned.				Sold.	Spoiled and Returned.				Sold.	Spoiled and Returned.

ORDER TO SELL A TICKET TO A PARTICULAR PARTY AT A PARTICULAR RATE.

_____ RAILWAY.

GENERAL TICKET DEPARTMENT.

_____, 189__

Ticket Agent _____ Station: _____

You will furnish _____

with _____ Class Ticket__, using Form _____

From _____ to _____

At _____ Limiting same to _____

☞ Tickets must be procured before entering the cars, as Full Fare will be required otherwise. This Order is Not Transferable and must be exchanged for Tickets within _____ days from date, otherwise void. Endorse "SPECIAL" across the face of Ticket furnished.

_____ General Ticket Agent.

Countersigned

14827

This is to certify that I have furnished Ticket No. _____ Form _____ on this order.

_____ Agent.

FORM TO BE USED BY AGENTS WHEN TICKETS ARE ISSUED IN EXCHANGE FOR THE TICKETS OR ORDERS OF OTHER COMPANIES; ALSO FOR GOVERNMENT REQUESTS, ETC.

EXCHANGE MEMORANDUM.

TO THE TICKET AUDITOR.

Dear Sir:—As per my office stamp below, I have this day issued the following described ticket in exchange for the ticket, order or request attached hereto; the same having been accepted as an exact equivalent for the value of the ticket exchanged, or for $_____ the balance, $_____. being collected in cash.

DESCRIPTION OF TICKET ISSUED.

Form	Number.	Class.

_____ Agent.

STAMP HERE.

Daily Record of Closing Numbers and Monthly Summary of Local Tickets on Hand, Received, Sold, Spoiled and Returned.

At_____Station, for the Month of_____189__

Highest Numb'r on Hand.	Stations.	Rate.	Com'g No. for Month or Lowest No. on Hand.	Clos'g No. 1st Day.	Clos'g No. 2nd Day.	Clos'g No. 3rd Day.	And so on.

MONTHLY SUMMARY

Of Local Tickets Sold, Spoiled and Returned.

First Class.			Round Trip.		Excursion.		Total.
Full.	Half.	Amount.	No.	Amount.	No.	Amount.	Amt.

EARNINGS REPORT

WEEKLY RETURN OF LOCAL TICKET SALES.

STAMP HERE

From _____ (No. _____) Station,

_____ State _____ Division,

for the Week ending _____ 189__

The total amount of revenue received at this station from the sale of Local Tickets during the week just closed, was

DOLLS.	CTS.

_____ Dollars.
100

_____ Agent.

NOTICE.—This return must be forwarded weekly. It must be an accurate statement of the total revenue derived from the sale of Local Tickets.

It must be forwarded promptly after closing the sales for the day, on the 7th, 14th, 21st, and last day of the month, whether there are sales to report or not.

When it is impossible to forward this return by ordinary train mail without delay, agents must telegraph the amount.

EARNINGS REPORT.

Return of Interline Ticket Sales.

To the Ticket Auditor:

The following is a statement of Interline Tickets sold

At _____ Station, for the _____ 189__.

_____ Agent.

Destination	Form.		Class.	No. Sold.	Through Rate.	This Co.'s Proportion of Thro. Rate.	Gross Earnings of this Company.
	Pasters.	Other Forms.					

NOTE.—The last two columns will be left blank, when the agent does not know this company's proportion.

MONTHLY RETURN

Of Interline Ticket Sales at Station Noted Below for Month Stated.

SELLING STATION.	AGENT.	FOR MONTH OF	YEAR.	ENCLOSURES.	Agents will enter below:
			189	Ticket Stubs? ..... Void Tickets? ..... Authorities ?	Authorities for all Spl. Rates; Occasions for all Spl. Excursion Rates; Routes of Special and Skeleton Tickets; Nos. of Void Tickets and Coupons; Description of all Tkts, Orders, etc., taken in Exchange for Tickets Issued.

Summary of Forms Issued				DESTINATION.		PASTER.			Complete and Extension.			Class.	No. Pass	ENCLOSURES.	
Forms.	Com. No.	Class No.	No.	Station.	State.	Forms.	Numbers.	No.	Forms.	Numbers.	No.			Rate.	Amount.

NOTE.—This is one of three forms, viz: the Monthly Return, Apportionment Detail, and Agent's Record of Interline Ticket Sales. The last mentioned form is retained by the agent as his station record; the other two are sent to the ticket auditor. The Monthly Return is checked and filed by him for general use; the Apportionment Detail is pasted upon division sheets and is used in figuring the proportions due to other companies. Under the Multiplex system of accounts all three are written simultaneously.

RECEIPT GIVEN TO PASSENGERS FOR PROPERTY PLEDGED FOR FARE OR OTHER PURPOSE.

THIS IS TO CERTIFY THAT I HAVE

This_____ day of_____ 189__

received the following described property as

COLLATERAL SECURITY, viz:_____

_____

Baggage Check No._____

On account of the sum of $_____

Due this Company for passenger fare from

_____ to _____

_____ Conductor.

NOTE.—A copy of this is to be kept by the maker; a copy is to be sent to the ticket auditor; a copy is to be sent with the property and check to the agent where the goods are to be redeemed.

MONTHLY RETURN OF EXCESS BAGGAGE.

STATION.	No.	STATE.	DIVISION.	FOR MONTH OF	YEAR
					189

.....189

To the TICKET AUDITOR.—The following is a statement of receipts from the sale of excess baggage tickets, and the collection of charges on baggage forwarded and received at this station; also, a report of all baggage forwarded C. O. D during the month stated above.

.....Agent.

RECAPITULATION OF CASH RECEIPTS.	AMOUNT.	AS CORRECTED BY TICKET AUDITOR.
LOCAL CHARGES (PREPAID and C. O. D.—including Baggage Ticket Sales, Storage, Lost Checks, Etc.)		
INTERLINE CHARGES—PREPAID and C. O. D.		
TOTAL,		

CARDS, WAY-BILLS, ETC.	LOCAL.				INTERLINE.			
	Com'g No.	Clos'g No.	No.	VOID NUMBERS.	Com'g No.	Clos'g No.	No.	VOID NUMBERS.
PREPAID CARDS,								
C. O. D. "								
BAGGAGE TKTS.,								
" "								
" WAY-BILLS,								
STORAGE,								

BAGGAGE FORWARDED C. O. D.					AMOUNT TO BE COLLECTED AT DESTINATION.		REMARKS.
Card No.	DESTINATION.	ROUTE.	Excess Weight.	RATE.	LOCAL.	INTERLINE	

CHARGES COLLECTED ON LOCAL AND INTERLINE BAG'GE.					LOCAL.		INTERLINE.	
Card No.	DESTINATION.	ROUTE OF INTERLINE.	Excess Weight.	RATE.	COUPONS.	CASH.	COUPONS.	CASH.
	Excess Baggage Ticket Sales,							

RECORD OF MONTHLY RETURN OF EXCESS BAGGAGE.

STATION.	No.	STATE.	DIVISION.	FOR MONTH OF	YEAR
					189

Forwarded to the TICKET AUDITOR, ... 189....

showing the receipts from sale of excess baggage tickets, and collection of charges on baggage forwarded and received at this station; also, the detail of all baggage forwarded C. O. D. during the month stated above.

.....Agent

RECAPITULATION OF CASH RECEIPTS.	AMOUNT		AS CORRECTED BY TICKET AUDITOR	
LOCAL CHARGES (PREPAID and C. O. D.—including Baggage Ticket Sales, Storage Lost Checks, Etc.)				
INTERLINE CHARGES—PREPAID and C. O. D.				
TOTAL,				

CARDS, WAY-BILLS, ETC.	LOCAL.				INTERLINE.			
	Com'g No	Clos'g No	No	VOID NUMBERS	Com'g No	Clos'g No	No	VOID NUMBERS.
PREPAID CARDS,								
C. O. D. "								
BAGGAGE TKTS.,								
" "								
" WAY-BILLS,								
STORAGE,								

BAGGAGE FORWARDED C. O. D.					AMOUNT TO BE COLLECTED AT DESTINATION.		REMARKS.
Card No.	DESTINATION.	ROUTE	Excess Weight	RATE	LOCAL.	INTERLINE	

CHARGES COLLECTED ON LOCAL AND INTERLINE BAG'GE.					LOCAL.		INTERLINE.	
Card No	DESTINATION	ROUTE OF INTERLINE	Excess Weight	RATE	COUPONS.	CASH	COUPONS	CASH
	Excess Baggage Ticket Sales.							

INDEX

STATION WORK AND TELEGRAPHY.

The Organization of Railways 5
Employes at Railway Stations—
- Messenger boy 25
- Telegraph operator 26
- Freight office messenger boy and clerk 28
- Cashier 28
- Chief clerk 31
- Freight agent 32

Railway Telegraphy and Telephony—
- The telegraph 39
- Instructions for beginners 42
- Learners' instruments and how to connect for practice 43
- The Morse alphabet 45
- Transmission 48
- Position 49
- Movement 49
- Exercises in sending 51
- Formation 54
- Hints in sending 56
- Punctuation 58
- Receiving 59
- Penmanship 60
- Battery 61
- Conductors and insulators 63
- Magnetism 63
- Electro-magnet 64

Railway Telegraphy and Telephony—Continued.
The key 64
The relay 66
The sounder 67
Adjustment of Instruments—
The key 69
The relay 69
The sounder 70
The switch board 70
Ground wire 72
General instructions for circuit 77
Wire signals used in taking the circuit from others 80
Numeral wire signals 80
Abbreviations 81
General rules and instructions for telegraph employes 91
Chief operator 91
Operators 92
The double order system 98
General instructions in train order wire work .. 99
Order of transmission 99
Acknowledgment of receipt of train orders 100
Order of "X ing" 100
Order of repeating 101
How to copy orders on the forms 101
Train order wire work 106
Breaking in train orders 107
Railroad telegrams 108
General instructions in railway message wire work 108
Order of transmission 109
How to copy messages on the forms 109
Breaking in railway messages 112

Adjustment of Instruments—Continued.
The detail train report....113
Car report local....114
Car report—foreign....116
General instructions in commercial message work. 117
Order of transmission....119
The sending form....120
Receiving form and how to copy on the same...122
Receiving form....124
Timing of sent copies....125
Breaking in commercial messages....126
Mistakes in checks....126
Commercial messages explained....127
More than one address....127
Street addresses....129
More than one signature....129
Title words....130
Reporting delivery....131
Repeated message....132
Special delivery....132
Extra dates....134
Other line messages....136
When an answer is prepaid....137
Night messages....138
Code messages....139
Cipher messages....140
Government messages....141
Dead-head messages....141
Cables....142
Press special....144
Service messages....145
Abbreviations used....145
Forms used in transmission....146

Adjustment of Instruments—Continued.
Explanation and different forms used.....147
When charges are not guaranteed.....148
Where the street number mentioned in the address of a message cannot be found.....148
Wrong address 148
Corrected address 148
When message is delayed.....149
If the addressee of a collect message refuses to pay for the same.....149
When a message has been lost or not understood, ask for duplicate.....149
Asking for duplicate of a certain word.....149
Duplicating a certain word.....149
When no street address is given.....150
When a service has been sent and another follows changing the first.....150
When the addressee has changed residence.....150
When the addressee leaves town before a collect message arrives for him.....150
When a message is sent to wrong destination...150
Asking for quick answers.....151
Number service messages.....151
Giving skeleton 151
Commercial news department.....151
Abbreviations 152
Option months 152
Grain C N D.....152
Provisions C N D.....152
Abbreviations used in live stock C N D.....153
Opening live stock C N D.....153
The 8:40 A. M. C N D.....153
Grain special for publication.....154

The Telephone—
Description of the telephone....157
Telephones in railroad work....185
Train orders by telephone....189
Train dispatching by telephone....197
Dispatcher's office equipment....205
Sub-station equipment....208
Block-signal telephones....222
Siding telephones....223
Telephones for calling train crews....223
Telephone service for roundhouses....224
Wrecking train service....224
Telephone service in freight yards....225
Composite service....226
Long-distance service....229
Ownership of equipment....231
Service with other roads....231
Points in favor of telephony....233
Simultaneous telephony and telegraphy....233

General Rules for Managing Railway Stations—
General rules covering the management of railway stations....267
Freight forwarded....269
Passenger or ticket department....276
Baggage department....279

Station Reports—
Returns from local freight stations....285
Regular reports....286
Irregular reports....291
Railway yards and handling cars....297
Handling cars in yards....300
Distribution of cars....304

Extracts from the Code of Rules—
Governing the condition of, and repairs to, freight cars for the interchange of traffic.....313
Care of foreign freight cars.....313
Interchanging freight cars.....313
Use of defect card.....314
Defects of wheels which justify renewal.....316
Defects of axles which justify renewal.....320
For cars marked with "Capacity".....321
For cars marked "Maximum Weight".....321
Trucks 322
Brakes 322
Bodies 322
Improper repairs.....325
Instructions to repair men.....326
Use of repair card.....333
Instructions for billing.....335
Destroyed cars and the return of trucks.....347
Sending home worn-out and damaged cars.....348
Furnishing materials.....350
Conditions of acceptance of this code.....351
Settlement of disputes.....351

Code of Rules—
Governing the condition of, and repairs to, passenger equipment cars in interchange.....352
Defects in wheels—Owners responsible.....355
Wheels—Cast-iron 355
Wheels—Steel-tired 356
Delivering company responsible.....357

Catechism—
Of the rules governing condition and repairs of freight cars for the interchange of traffic....359

Fast Freight Systems—
The Red Ball system of handling fast freight...385
Expediting movement of manifest fast freight...389
Station Reports, Cars, Fast Freight Mail Service—
Railway mail service.....399
Appendices 423

NOV 16 1909

DEC 4 - 1950

Deacidified using the Bookkeeper process.
Neutralizing agent: Magnesium Oxide
Treatment Date: April 2004

PreservationTechnologies
A WORLD LEADER IN PAPER PRESERVATION
111 Thomson Park Drive
Cranberry Township, PA 16066
(724) 779-2111

LIBRARY OF CONGRESS
0 012 134 862 7